73 AMATEUR RADIO

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A WGE Publication

HOT HF ANTENNAS

For Close Quarters:

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The Aluminum Cloud

For Wide Open Spaces:

Balloon Antennas

Reviews!

HF Mobile Antennas
Nye Power Monitor

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Cheap and Easy 30 M Transceiver (Part 1)

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CIRCLE 10 ON READER SERVICE CARD

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A 3-digit turns counter plus a spinner knob gives you *precise* inductance control -- so you can quickly return to your favorite frequency.

You get a lighted Cross-Needle meter that not only gives you SWR, forward and reflected power at a glance -- but also gives you a **peak-reading** function! A new directional coupler gives you even more accurate readings over a wider frequency range.

You get a 6-position ceramic antenna switch that lets you select two coax lines and/or random wires (direct or through tuner), balanced line and external dummy load.

A new **current** balun for balanced lines minimizes feedline radiation that causes field pattern distortion, TVI and RF in your shack. Ceramic feedthru insulators for balanced lines withstand high voltages and temperatures.

New Antenna Tuner Technology

MFJ brings you **three innovations** in antenna tuner technology: a new *Differential-T*™ circuit simplifies tuning; a new *directional coupler* gives you more accurate SWR, forward and reflected power readings; and a new *current balun* reduces feedline radiation.

Differential-T Tuner™: A New Twist on a Proven Technology

By replacing the two variable capacitors with a single *differential capacitor* **you get a wide range T-network tuner with only *two* controls** -- the differential capacitor and a roller inductor.

That's how you get the new MFJ Differential-T Tuner™ that makes tuning easier than ever, gives you minimum SWR at only one setting and has a broadband response that ends constant re-tuning. You'll spend your time QSOing instead of fooling with your tuner.

The compact 10¾ x 4½ x 15 inch cabinet has plenty of room to mount the silver-plated roller inductor away from metal surfaces for maximum Q -- you get high efficiency and more power into your antenna.

The wide spaced air gap differential transmitting capacitor lets you run a full 3 KW PEP -- no worries about arcing.

A New Directional Coupler: Accurate SWR and Power Reading

MFJ's Cross-Needle SWR/Wattmeter gives you more accurate SWR and power readings over a wider frequency range with no frequency sensitive adjustments.

That's because MFJ's new directional coupler gives you up to an order of magnitude higher directivity and coupling factor than conventional circuits . . . *plus* it gives you a flat frequency response that requires **no** frequency compensation.

The cross-needle meter lets you read forward/reflected power in 2 ranges: 200/50 and 2000/500 watts. The meter lamp is front-panel switched and requires 12 volts.

A switch lets you select peak or average power readings.

A New Current Balun: Reduces Feedline Radiation

Nearly all commercially built tuners use a "voltage" balun. The "voltage" balun forces the *voltages* to be equal on the two antenna halves. It minimizes unbalanced currents *only* if the antenna is perfectly balanced --not the case with practical antennas.

The MFJ-986 uses a true **current balun** to force equal *currents* into the two antenna halves -- *even* if your antenna is not perfectly balanced -- so you get minimum unbalanced currents.

The *current* balun gives superior balance over the "voltage" balun.

Minimum unbalanced current reduces field pattern distortion -- which concentrates your power for a stronger signal -- *plus* it reduces TVI and RF in your shack caused by feedline radiation.

The MFJ-986 Differential-T Tuner™: Get *absolute minimum* SWR

Get the tuner that incorporates the latest innovations by the world's leader in antenna tuner technology.

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CIRCLE 24 ON READER SERVICE CARD

Welcome, Newcomers!

What is HF?

"So, how far can you talk on that thing—Russia?!"

This is a typical skeptical question non-**hams** ask as they tour the **shack**, nodding their head toward the radio equipment. Usually, I sit down, warm up the **rig**, and within ten minutes prove to them that it is, indeed, possible to speak with Soviets, Japanese, Australians. . . with people in any part of the world! Often enough, their doubt turns to awe. Direct communication with someone anywhere on Earth is one of amateur radio's classic lures!

Consistent direct worldwide communication occurs only on the amateur radio **bands** located in the **High Frequency (HF)** portion of the **radio frequency spectrum**. Why only there, and not at higher or lower bands?

Look Upward

It helps to first know something about the **ionosphere**. This is a wide, electrically charged atmospheric layer located 35–200 miles above the Earth's surface. It exists because solar energy from space bombards the upper atmosphere, separating atoms into ions and free electrons. As this energy continues through the atmosphere toward Earth, ionizing as it goes, it grows weaker. Negligible ionization takes place below 35 miles above the Earth.

How does this affect radio waves?—it bends them! As the wave passes from an area of lesser ionization to one of greater ionization, its angle to the division line is less going away from it than what it is going into it. If a wave approaches that division line at a shallow enough angle, the wave departing the division line will travel parallel to that line. If the approach angle is shallower still, the "departure" wave will turn back into the original medium (i.e., the lower atmosphere). You can easily imagine this last scenario for a radio wave from Earth entering the ionosphere, since it's constantly passing into areas of higher ionization.

A wave refracted in the last case travels back to Earth. The Earth reflects it back toward the ionosphere. Waves that travel in this vertical zig-zag pattern between ionosphere and Earth are called **sky waves** or **skip waves.** The signals your radio picks up from distant short wave and AM stations at night are carried on sky waves.

Radio waves higher than a certain frequency, however, pierce the atmosphere and continue out into the vast unknown. This happens because they have too much energy and too narrow a wavelength for the ionosphere to contain them. That "certain frequency," called the Maximum Usable Frequency (MUF), varies with how densely ionized the ionosphere is. The more this layer is bombarded with solar energy, the more ionized it becomes, and the higher an MUF it allows. The MUF, however, generally doesn't go above 30 MHz—the top end of the HF subspectrum.

A number of factors determine the minimum frequency for effective skip-wave communications. The two main factors are ionospheric absorption and atmospheric noise. As you go down the spectrum in frequency from the HF subspectrum, the lower layers of the ionosphere increasingly absorb radio waves, and there is a higher level of "natural" noise—random radio waves generated by thunderstorms and other sources of atmospheric static discharge.

Why September?

The fall is the best time for sky wave **propagation** across the entire HF subspectrum. The upper layers of the ionosphere are still ionized enough to allow high MUFs, which keeps the higher frequency HF bands **open.** At the same time, however, the lower frequency HF bands are usable because the active weather has subsided, reducing the atmospheric noise level, and the lower ionospheric layers are not so prominent, which leads to less **attenuation** of these waves. This time of year, it's sometimes even possible to hear **DX** activity on 160 meters, amateur radio's only **Medium Frequency (MF)** band. During this time also, you often hear sky-wave activity on the **10-meter** band. This is especially significant for newcomers to the hobby: 10 meters is the one HF band on which the Novice—amateur radio's entry-level licensee—has **voice** privileges!

. . . de NS1B

GLOSSARY

Attenuate—Lessen, reduce in power.

Band—A group of frequencies in the radio frequency spectrum. The spectrum contains many subspectra, which in turn contain many bands.

DX—Long Distance. Distances considered DX varies with the band. Distances over 300–400 miles away are considered DX for 160 meters. Worldwide communications on 160 meters is infrequent, but does occur.

Ham—Jargon for amateur radio operator.

High Frequency (HF)—A subspectrum of the radio frequency spectrum ranging from a frequency of 3 Megahertz (3 million cycles/second) to 30 Megahertz (30 million cycles/second).

Ionosphere—A layer in the upper atmosphere, ranging 35–200 miles above the Earth's surface. So called because molecules at that level are ionized (i.e., they lose electrons) by solar rays passing through them.

Medium Frequency (MF)—A subspectrum of the radio frequency spectrum ranging from 300 kilohertz (300,000 cycles/second) to 3 Megahertz (3 million cycles/second). The AM broadcast band is a Medium Frequency band.

Open—Active.

Propagation—The transfer of energy through a medium, such as the atmosphere or space.

Radio Frequency Spectrum—The portion of the electromagnetic wave spectrum that covers waves whose wavelengths range from 30 kilometers to 1 millimeter. The corresponding frequencies are 10,000 cycles/second (10 kHz) to 3000 billion cycles/second (3000 GHz).

Rig—Jargon for a transmit/receive radio, also known as a transceiver.

Shack—Jargon for radio room.

Sky Wave—A radio wave that travels up to, and is then refracted back to Earth by, the ionosphere. A single sky skip wave—one that is refracted just once by the ionosphere—can travel up to several thousand miles. They are mainly responsible for worldwide radio communications.

Voice—This refers to the modulation of the radio wave by signals produced by the human voice. This is normally done by speaking into a microphone. Novice class hams are allowed to operate only CW (Morse code) on the other HF bands.

10-meter band—Amateur radio's highest frequency HF band. It ranges from 28 Megahertz (28 million cycles/second) to 29.7 Megahertz (29.7 million cycles/second).

QRM

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Contractual Agreement: Under penalty of lost signal strength, you must agree to the following contract. You will no longer neglect Amateur Radio's Prime Directive: to enthusiastically espouse the hobby where no ham has gone before. In other words, get out there and hustle! This is a great hobby, and you owe it to all of hamdom to recruit new licensees from all walks of life. Where do you start? Try your neighbors, unless you've already turned them against you with RFI. How about your local school or church? Put together a packet demo at the computer store. There you go. Now you're cookin'. And above all, let us know how you're doing.

73 AMATEUR RADIO

SEPTEMBER 1988 — Issue # 336

TABLE OF CONTENTS

FEATURES

10 Antenna Systems
Sometimes "good" is bad and "bad" is good. W3ZC

14 Aluminum Cloud
A top performer for cliff dwellers. NF0R

18 Balloon Supported Antennas
How to really get out on 80 and 160 meters. W1GV

23 MARS and Amateur Radio
The military affiliated radio system. W1ZM, NNN0WAJ

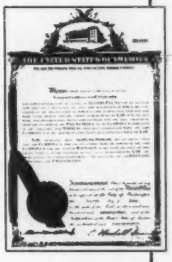
27 Auto VIM: Part Two
Smart power supply for every bench. W4RNL

30 Pee Wee Thirty Transceiver
A compact 30 meter CW/AM QRP transceiver (Part 1). AC9E

39 Patents are Unique
Protecting your brainchild. W5PFG

44 Choosing a QSL Card
Which style and design reflects you best? WA6OHX

48 The "Crew at 22"
Set to fight AIDS on the air. WB2JKJ



REVIEWS

16 Butternut Butterfly
An antenna for small quarters that takes a little more work–but well worth it! WA4BLC

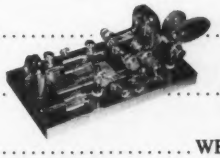
22 HF Mobileering
W6AAQ helps you avoid the common pitfalls of mobile HF operation NA5E

36 Nye Viking RFM-003 RF Power Monitor
One of the more versatile RF monitoring devices on the market. NS1B

40 Beauty and the Best
Something old, something new from Vibroplex. NA5E

42 Ramsey CT-90
A portable frequency counter. WB9RRT

49 The MFJ Gray Line DX Advantage
The computer terminator. KA9KAF



DEPARTMENTS

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87 Above and Beyond
74 Aerial View
80 Ad Index
60 ATV
90 Barter and Buy
58 Dealer Directory
71 DX
81 Feedback
85 Ham Help
67 Hamsats
57 Index: 9/88
57 Letters
6 Never Say Die
55 New Products
77 Propagation
9 QRX
89 QTH DX
82 73 International
94 Special Events
4 Welcome, Newcomers

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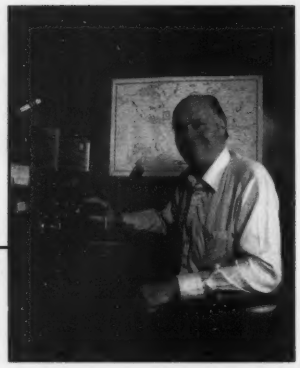

Right As RAIN

A contretemps erupted at Dayton. The Radio Amateur Information Network people were astounded and amazed to find themselves being attacked by the League. I chuckled as I reached for their coats.

For years, the League has broadcast its news bulletins over the Official Broadcast Station (OBS). Despite the FCC regulations prohibiting broadcasting—via W1AW with paid operators—and despite the FCC regulations against paid operators for amateur radio stations, the League is suddenly concerned over the broadcasting by RAIN.

The League sent Mendelsohn, the Hudson Division Director, to do the dirty deed at the RAIN session at Dayton. Steve called the kettle black in front of the crowd, just about destroying the meeting for RAIN.

Hmmm, wondered those not too gifted with acumen, what ARE the FCC rules about broadcasting? Golly, gee, the rules do say that broadcasting is prohibited. The RAIN people went into logic fibrillations while Mendelsohn, displaying his most benevolent sneer, snickered inwardly at how he'd snookered them, wiping the blood from his verbal snee.

Arguing about the FCC rules is as productive as arguing about Bush's platform—with solid answers as elusive. Sure, broadcasting is prohibited. It's illegal. But it also isn't defined. In that respect, the League hasn't been flat out breaking the rules all these years—only in spirit. Not like the paid-operator rule, which the FCC has known about from day one and blind-eyed. Tsk, another scandal. Ho hum.

The RAIN crowd—and it's getting to be a large crowd these days—has broadcast "bulletins" on 3975, 14275 and 28475 at 1300, 1700, 2100, 0000 and 0400Z daily. They encourage their large network of stations to tape these broadcasts and repeat them on other bands, via repeaters and so on.

With relays all over the world—New Zealand, Australia, Japan, South America, Central America, Europe, and the Middle East, there is an understanding of why the League might be beginning to panic. In case your knowledge of ham history is vague, the League has maintained its position as the only representative of amateur radio in America by ruthlessly killing off every upstart. Hey, that's the American way, right? That's the way our corporations do it—the way one of our largest industries, organized crime, does it—the way politicians do it. You can't ask for a more accepted and pragmatic approach to survival.

RAIN has thousands of listeners who tune in to their broadcasts every day. Indeed, I suspect that the only thing preventing the listening audience from becoming two or three times its size is the inability of so many amateurs to translate GMT (Z) into local time . . . so they're never sure exactly when to listen.

I'm exaggerating, right? There goes Wayne again. Well, let me lay it out for you where it hurts—many hams can't tell time. I've DXed from dozens of countries and then come back to stacks of QSL cards. When I try to square the cards with my log sheets I go bananas. An amazing percentage of the DXers—the hams you'd think by now would have some inkling as to what time they've made a contact—even what day—get it wrong. I have to go through my logs, first checking plus or minus ten minutes or so to make up for the old Timex watches being used. Then I have to check plus or minus one to three hours—or translate from Central Daylight Time to GMT—for those who don't know just what the GMT time is. If I still can't find it, I try a day or two either way to make up for their using a calendar from some other year.

Messages of interest to amateurs are permitted to be broadcast by the FCC. It doesn't say

Continued on page 52

QSL OF THE MONTH

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TS-940S—the standard of performance by which all other transceivers are judged. Pushing the state-of-the-art in HF transceiver design and construction, no one has been able to match the TS-940S in performance, value and reliability. The product reviews glow with superlatives, and the field-proven performance shows that the TS-940S is "The Number One Rated HF Transceiver!"

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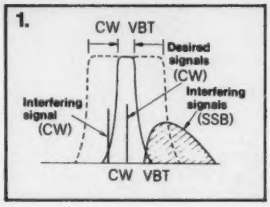

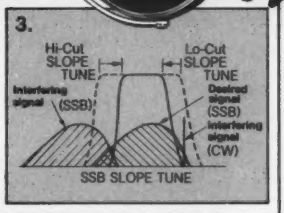

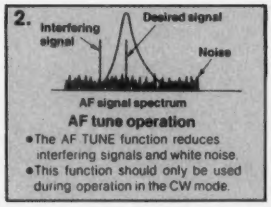
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Interfering signal
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Noise
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AF tune operation
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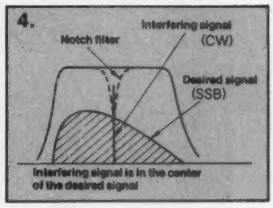
•This function should only be used during operation in the CW mode.



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4) IF Notch Filter. The tunable notch filter sharply attenuates interfering signals by as much as 40 dB. As shown here, the interfering signal is reduced, while the desired signal remains unaffected. The notch filter works in all modes except FM.

- **Complete all band, all mode transceiver with general coverage receiver.** Receiver covers 150 kHz-30 MHz. All modes built-in: AM, FM, CW, FSK, LSB, USB.
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- **Unique LCD sub display indicates VFO, graphic indication of VBT and SSB Slope tuning, and time.**
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Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features, and prices are subject to change without notice or obligation.

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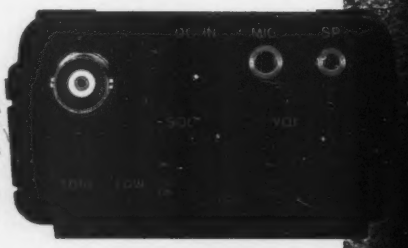

- **Wide receiver frequency range.** Receives from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or CAP permit required).
- **TH-315A covers 220-225 MHz, TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power source.** Supplied battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.
- **CTCSS encoder built-in.** TSU-4 CTCSS **decoder** optional.
- **10 memory channels store any offset, in 100-kHz steps.**
- **Odd split, any frequency TX or RX, in memory channel "0."**
- **Nine types of scanning!** Including new **"seek scan" and priority alert.** Also memory channel lock-out.
- **Intelligent 2-way battery saver circuit extends battery life.** Two battery-saver modes to choose, with power saver ratio selection.
- **Easy memory recall.** Simply press the channel number!
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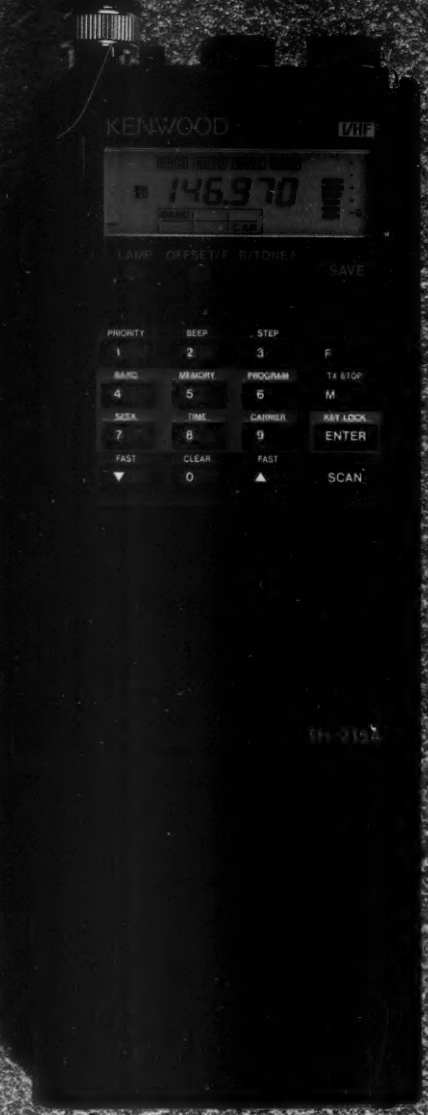
- **New Twist-Lok Positive-Connect™ locking battery case.**
- **Priority alert function.**
- **Monitor switch to defeat squelch.** Used to check the frequency when CTCSS encode/decode is used or when squelch is on.
- **Large, easy-to-read multi-function LCD display with night light.**
- **Audible beeper to confirm keypad operation.** The beeper has a unique tone for each key. DTMF monitor also included.
- **Supplied accessories:** Belt hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation), wall charger, DC cable, dust caps.



Optional Accessories:

• PB-1: 12 V, 800 mAH NiCd pack for 5 W output • PB-2: 8.4 V, 500 mAH NiCd pack (2.5 W output) • PB-3: 7.2 V, 800 mAH NiCd pack (1.5 W output) • PB-4: 7.2 V, 1600 mAH NiCd pack (1.5 W output) • BT-5 AA cell manganese/alkaline battery case • BC-7 rapid charger for PB-1, 2, 3, or 4 • BC-8 compact battery charger • SMC-30 speaker microphone • SC-12, 13 soft cases • RA-3, 5 telescoping antennas • RA-8B StubbyDuk antenna • TSU-4 CTCSS decode unit • VB-2530: 2m, 25 W amplifier (1-4 W input) • LH-4, 5 leather cases • MB-4 mobile bracket • BH-5 swivel mount • PG-2V extra DC cable • PG-3D cigarette lighter cord with filter

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QRX . . .

EDITED BY BRYAN HASTINGS NS1B

Net-Rom vs Nord Link

The average voice or CW enthusiast may have never heard the names Net-Rom, The Net, or Nord Link, but they mean a lot to packeteers. Now, these names could be the basis of the first big law suit to hit the packet radio community.

Both Net-Rom and The Net are programs designed to work with TNC 2-type packet controllers. They enable the digipeaters to network together for long-distance message routing. Net-Rom, a commercial product from a company called Software 2000, was first on the scene. Recently, from the other side of the Atlantic came The Net—a free, public domain program from a German packet group called Nord Link.

The German programmers say they designed The Net to be compatible with Net-Rom, with added sophistications. Mike Busch W6IXU and Ron Raikes WA8DED, who wrote Net-Rom, allege, however, that The Net is essentially an unauthorized reproduction of their copyrighted Net-Rom program code. Nord Link maintains they did their own program development, adding that they were disenchanted with having to buy new software every time there was a Net-Rom update. To add insult to injury, Nord Link moved up the release date of its latest source code of The Net by several months—it's now available free of charge.

Whether or not Nord-Link pirated the Net-Rom packet software still has to be determined. Net-Rom is a copyrighted product under United States law, which gives legal avenues to Software 2000.

AO-13 Update

The latest OSCAR is alive and well. Radar-derived Keplerian elements have replaced the estimated ones. The first set obtained by AMSAT-NA and relayed by KA9Q is as follows:

Temporary Catalog Number:	83803
Ref Epoch:	88167.6
Inclin:	10.056
RAAN:	244.932
Eccen:	0.7312844
Arg Per:	178.294
Mean Anomaly:	95.643
Mean Motion:	2.2535717
Decay:	0
Orbit:	0

The beacon frequencies are:

Mode B:	
GB:	145.812 MHz
EB:	145.985 MHz
Mode L:	
GB:	435.651 MHz
EB:	435.677 MHz

AO-13 may be heard on any one of these frequencies. The transponders should be available anytime.

For more information on getting started in satellites and on AMSAT membership, call AMSAT at 301-589-6062 or write: AMSAT PO Box 27, Washington, DC 20044.

No Worries, Mate

Special parking signs giving exclusive parking rights to radio amateurs are appearing throughout Australia. The Local Government Organization of Australia (LGOA), passed this resolution at its annual national conference in Melbourne. The LGOA amply praised the amateur radio in its news release about the resolution:

"The new signs are in recognition of the valuable contribution made by wireless experimenters, and now radio amateurs for just on 100 years . . . without their help, many local municipal plans would be inadequate."

The signs have been available from 1 April 1988 for erection at places visited by radio amateurs, including outside electronics stores and radio clubrooms.

Let's hope the folks "downunda" are setting a trend that will spread this way!

Drop by Dublin

The North Dublin and Fingal Radio Clubs are hosting the first annual EI Hamfest 24–25 September. There will be lectures on all aspects of amateur radio by speakers, including Louis G5RV, the inventer of the famed 160–10 meter wire antenna, and Hugh Turnbull, director of the Atlantic Division of the ARRL. The event will finish off with a large radio and electronic exhibition, earlier known as the "Junk Sale."

The Junk Sale started 10 years ago, when Ireland had little amateur activity (300 licensees and 180 active hams), and quickly grew to be the biggest ham radio related gathering in the country (and in GI-land). There are now 1200 licensed and 800–900 active hams in Ireland, many drawn into the hobby by this event.

INTA

The first six-meter openings, between Great Britain and the United States, occurred in the afternoon and evening of 6 June. G4ASR near Hereford worked fifteen stations in call areas W2, W3, W4, and W8. He also contacted a VE1. The opening lasted from 15:23–17:23 GMT. GJ6OZB says that he worked a total of fifty-eight stations in nine states. Three other stations in the north of England report contacting an FP8!

One negative note—German stations heard on 6 meters are operating illegally. They have neither licenses nor permits for 50 MHz operation, and should not be worked.

DARA Awards

Four young hams are a thousand dollars closer to fulfilling their educational goals thanks to the Dayton Amateur Radio Association. Lynn Bailey KA8PWD, Scott Sterling KA8UGM, Ross Lepiane WG7I, and David Milthaler N8GFX have been named as this year's winners of the annual DARA scholarship awards program. Each student will receive one thousand dollars to use exclusively toward paying their tuition at the college of their choice.

The Dayton Amateur Radio Association's scholarship program is open to any licensed amateur graduating from high school in the year an award is given. For further information about this program write to: The Dayton Amateur Radio Association, Scholarship Awards Program, 317 Ernst Ave., Dayton, OH, 45405.

Up, Up, and Away

The first of a series of Indiana balloon launches was a complete success. The W9PRD/WB8ELK balloon launched at 13:59 UTC on Saturday, 4 June. The flight ascended to at least 115,000 feet where it finally burst at 16:28 UTC. Early reports showed that the 2m beacon was heard as far away as W0RPK's QTH near Des Moines, Iowa, a range of 460 miles. While the 2m beacon was intermittent, it was strong and heard "nearly full quieting" by N8IWJ in Dearborn, Michigan on an HT with a whip antenna. ATV signals were strong within 200 miles of the Greensburg, Indiana launch site.

After bursting, it continued to transmit all the way down, for 5 hours thereafter, until it was located and recovered in the thickest part of the Hoosier National Forest after a very difficult search. Searchers found the remnents hanging 60 feet up in a tree with the electronics package some 20 feet off the ground. If it hadn't still been transmitting, they never would have found it. At recovery, its 13.3 volt lithium batteries were still reading 12.8 volts. WB8ELK indicates that a future launch will carry a television camera on board.

Thanks To . . .

***Westlink Report*, N8ADA, AMSAT News Services, RSGB, and EI2FRC. Send in all news items, photos, and other graphics concerning amateur radio to: *73 Magazine*, 70 Rte. 202N, Peterborough, NH 03458-1194, Attn: QRX**

ANTENNA SYSTEMS

Sometimes "good" is bad and "bad" is good.

John Lawson W3ZC

It is always a good idea to have everything in the antenna system matched. That is, 50Ω transmitter output, 50Ω transmission line, and a 50Ω antenna. This is rarely the case. If these conditions are not met, then it is important to know what gains can be realized for the effort expended. Stated very briefly, once we correctly understand mismatch and reflections in antenna systems we can obtain improvement in operational antenna flexibility.

This may be a bit optimistic because just about every ham has his own feelings and opinions regarding antenna systems, especially his own. Amateurs are results-oriented and what works *works*. Different amateurs have different desires and wants from ham radio. Some may erect an antenna and be satisfied to work Canada, Germany, Great Britain and the like. Therefore, his opinion of his antenna is that it is good (whether it is or not). For other amateurs, these kinds of results are not good enough. For him, the same antenna system is no good. The intent here is to get you, the reader, to understand or re-evaluate some thoughts on antenna systems, particularly when a decision point is reached.

In my 35 years as an amateur, it is my observation that the weakest link in any ham's knowledge of radio is his understanding of antenna systems: when to adjust and when to leave alone, when to discard and when to retain. The word today is that *SWR is King*. Most hams don't understand what SWR is, or know what it means. This is not entirely the fault of the amateur. Articles containing explicitly erroneous information and distorted concepts find their way into print, become gospel, and continue to be propagated. This incorrect information includes such pearls as:

1. Always requiring a perfect match between the feed line and the antenna.

2. Evaluating antenna performance, or radiation efficiency, only on the basis of feed line SWR.

3. Pruning a dipole to exact resonance at the operating single frequency and feeding with an exact multiple of half wavelength coax.

4. Adjusting the height or apex angle of an inverted V to make the resistive component of the antenna impedance equal to the line impedance.

5. Subtracting the reflected power from the forward power to determine the usable transmitter output power. Nomographs have even been published for this determination.

As a result of these misdirected concepts we have been conditioned to avoid any mismatch and reflection like the plague. 'One to one' all the way. These were also the observations of M. Walter Maxwell, W2DU, in his series of excellent articles that appeared in *QST* in the 1970s. After reading Maxwell, McCoy, or the ARRL publications, it is clear that any discussion of antenna systems is not for the faint of heart. It can get pretty deep. Although this article references these writings, it is shorter, more to the practical point, and is less technical.

History

Perhaps some history is in order. I have been around for a while, but I was not part of the pre WWII activity which is where this story begins. Before WWII, there was no coax cable or SWR bridges. Antennas were fed with open wire, which is two wires separated by spacers. This is still, by the way, the lowest loss transmission line available to amateurs today. Fifty ohms was just another resistance value. Open wire transmission line is several hundred ohms in impedance, and is dependent on the spacing and wire size. Pre WWII hams monitored antenna performance by field strength meters, antenna current RF meters, bulbs, sparks, and RST reports. How did they couple power from the transmitter to the antenna *system*? Most transmitter outputs had swinging links, Faraday shields, and large wide-spaced output capacitors.

This section of the transmitter was called the "antenna coupler" which was really a misnomer. It should have been called the "antenna system coupler." It did nothing to match the antenna to the input of the transmission line. It matched the transmitter output to the transmission line antenna combination. After WWII amateur radio entered the era of coaxial cable. Coax was used extensively by the military during the war and became available to hams after the war.

Enter Coaxial Cable

What is coax cable? It is two conductors (cylinders, if you will) concentric with one another separated by a dielectric material. If the cable is made uniformly, its impedance does not change with length. That is, a piece of 50Ω cable, properly terminated, is 50Ω whether you're looking at a 6 foot length or a 100 foot length. The impedance is determined by the conductor sizes, the spacing between the conductors, and the dielectric material. Fifty ohm cable was a practical size of cable to use because its physical properties *made* it practical. Hams readily accepted coax because it was easy to run and connect, and with TVI rearing its head, it was important to have a shielded transmission line.

It had several drawbacks. One was it was more lossy than open wire. Another was it came in such low values of impedance—a far cry from the 600Ω open wire. Thinking had to change. This was the start of the 50Ω system. Antenna designers fell into line, as did transmitter designers with the pi net output circuit. The pi net made it easier to match the transmitter output to the antenna system.

The pi net was more attractive to manufacturers because it eliminated some of the more costly components and was more acceptable to amateurs because of its ease of adjustment. The pi net is really part of the transmitter and can be considered an antenna tuner, or, more precisely, an antenna system tuner.

Antenna Tuner

What does an antenna tuner do? It matches the transmitter output to the antenna system. It does not change the mismatch within the antenna system itself, such as between the transmission line and the antenna. Tuning the antenna system does not have to be part of the transmitter. It can be outboard, like a Transmatch, a "T" match, or an "L" match.

Transmatch

Stated as simply as possible, a Transmatch

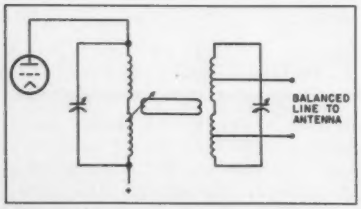

Figure 1. Typical pre-World War II output circuit.

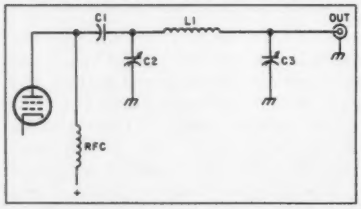

Figure 2. Pi-network transmitter output circuit.

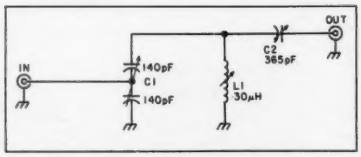

Figure 3. A transmatch used to match non-50Ω antennas to transmitter output circuits.

is a circuit consisting of coils and capacitors that is a "reactance tuner-outer." It is a combination of coils and capacitors that make up an adjustable RF transformer. The function of a good Transmatch is to take an unknown load of an antenna system and convert it to a load that is compatible with the transmitter by inserting a conjugate match into the antenna system.

Conjugate Match

A conjugate match can be explained for amateur radio as follows, without getting too deeply involved in the R±jX situation.

If your antenna is too long for the frequency of operation, the antenna is inductive. So you must add capacitance to compensate so that the transmitter sees an impedance that it can tune. The cap that you add is the conjugate match. Similarly, if the antenna is too short, the antenna is capacitive. You must add inductance. The inductor that you add is the conjugate match.

A conjugate impedance is really a match of opposite polarity for the mismatch. It is always a "C," (which is −) , or an "L", (which is +), or a combination (such as in a Transmatch). Reactive components such as C's and L's do not consume power. Resistors do. So you don't want to add any R. In real life there is always resistance—the resistance of the wire in the coil, the leakage across a capacitor, the resistance of plugs and receptacles including coax connectors. But the advantages gained by adding the proper L or C far outweigh the disadvantages of inserting a small amount of R.

R ± jX

First, two facts must be stated that should be easy to accept.

1. Power can only be absorbed by a resistive load. A resistive load may consist of a resistor, the resistance of the wire in an inductor or coil, the leakage within a capacitor, or the radiation resistance of an antenna.

2. Power cannot be absorbed by an open circuit, a short circuit, or reactive components such as pure inductances or pure capacitances.

These facts should be easy to accept.

In an amateur radio transmitting setup the following components are usually available.

When everything is matched, maximum power is absorbed by the antenna because the impedance of the antenna at the frequency of resonance, F_r, is R+j0.

What does this mean? Briefly, the convention for expressing a complex impedance, that is, one containing resistance and reactance is in the form R±jX, where R is resistance and X is reactance. The "j" is equal to the square root of 1 which is undefined, and, unfortunately, appears quite often in engineering. (The + denotes inductive and the − denotes capacitive.)

Back to the scenario. At resonance the impedance of the antenna is R+j0, which indicates that it is only resistive and the antenna will absorb all of the available power. If you lower the frequency of operation, the antenna is too short (capacitive) so

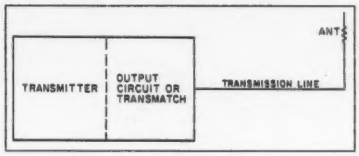

Figure 4. Typical transmitter and transmatch arrangement with antenna system.

the impedance of the antenna is R−jX, where "X" is some value of reactance. If you raise the frequency, the antenna is too long (inductive so the impedance of the antenna is R+jX.

In the case where the antenna is too long, such as when you have a resonant dipole antenna at 3501 kHz and you tune up on 3999, the antenna is inductive.

The assumption is that the transmitter output circuit can be tuned properly, or that a Transmatch is in the transmission line. The power wave going down the antenna sees an impedance of R+jX when it reaches the antenna. Since part of this impedance is reactive, some of the power wave will be reflected and not absorbed by the antenna.

When the reflected wave reaches the input of the transmission line it sees an impedance of 0 jX in the output circuit of the transmitter or in the Transmatch, if one is used. Since the "R" portion of this impedance is zero, no power is absorbed (fact 2 above and the reflected wave is re-reflected towards the input of the transmission line, adding to the power wave from the transmitter.

This is why when you tune your Transmatch you read a higher power before you have the final matched settings. After you have set the power output tuning properly, the re-reflected wave does not travel past the transmitter output circuit or Transmatch, so all you are reading is the matched transmitter output power.

The common belief that high reflected power damages the transmitter output tubes or transistors is hogwash. It just doesn't happen. The reflected power wave never reaches the finals. If no type of matching device (such as a Transmatch) is used, the reflected wave does cause a change in antenna system input impedance, which makes loading difficult. If the transmitter can be loaded properly without a matching device, the output circuit re reflects the reflected wave the same as described above. The finals are safe from the ravages of the reflected wave. If your transmitter cannot load properly, things will heat up, possibly arc over, and cause general grief. The solution is to add a matching device, such as a Transmatch, so proper transmitter loading can be effected.

SWR

And along came the SWR bridge. Here was an easy method of checking something in the antenna system without resorting to RF meters mounted at the antenna feed point and using binoculars to read it; or resorting to RST reports which at best were and are not very reliable. There is one attribute about the ham community that is almost universal. And

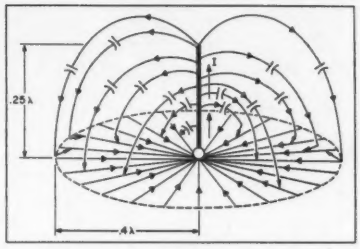

Figure 5. Quarter-wave vertical antenna near-field electrical characteristics.

that is that they don't like to offend other hams. The receiving ham will give the best possible report, often erroneous, because the transmitting ham many times will not take too kindly to a bad report.

So, RSTs are usually out as far as performance is concerned. Oh, one ham in 50 will give you a conscientious report. If you find one, keep this person in mind when you decide to do some antenna work.

What are SWR meters and what do they measure?

SWR meters are used to give direct reading SWR values. You tune up your transmitter and adjust a knob on the SWR meter to obtain a full scale reading with the switch in the 'forward' position. Then, without touching the knob, you switch to the 'reflected' position. The scale is calibrated in SWR and the meter will read directly. Many hams today have reflectometer type power meters that read forward and reflected power. There is no adjustment. You read forward and switch to read reflected. With this type of meter you must calculate the SWR from the equation

$$SWR = (1+k)/(1-k)$$

where k is the square root of the ratio of reflected to forward.

This can be cumbersome. Most hams remember a couple of values and extrapolate. That is, a reflection of 10% = an SWR of 2:1. A reflection of 50% = an SWR of 6:1. The only thing that an SWR bridge measures is the degree of mismatch in the antenna system. In itself, it cannot tell you about the efficiency of your system. In itself, it cannot tell you about the performance of you system. What it does tell you is that your transmitter (and by the way, your receiver is looking into a matched or mismatched antenna system.

This does not mean that if you are obtaining a one to one that you have a good system.

Other Considerations

The following discussion is an example of how other factors besides the feed line and antenna enter into the picture in a discussion on a vertical antenna situation. Before we get to discussing a vertical antenna situation, I would like to refer you to the Table 1 that can be used to convert those wretched dB's to something more understandable.

A couple of things should be said about dB's. First, this table relates to power and not to voltage. The voltage dB chart is something different. Second, to use the table you must determine if you're talking gain or loss. Then

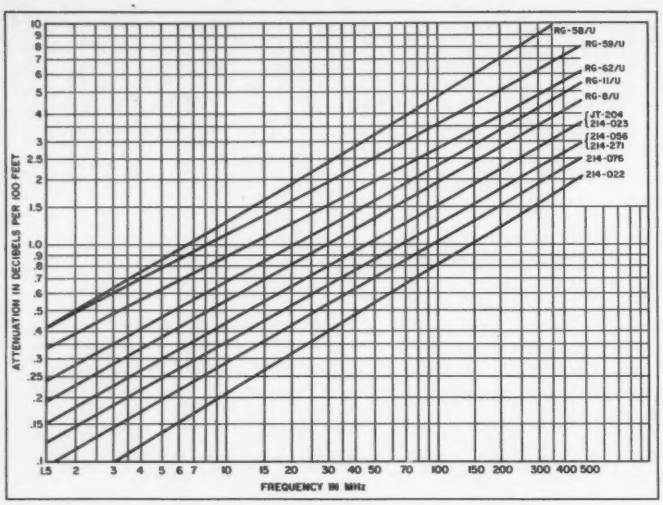

Figure 6. Signal loss through coaxial cable according to frequency and cable type. From ARRL Antenna Book.

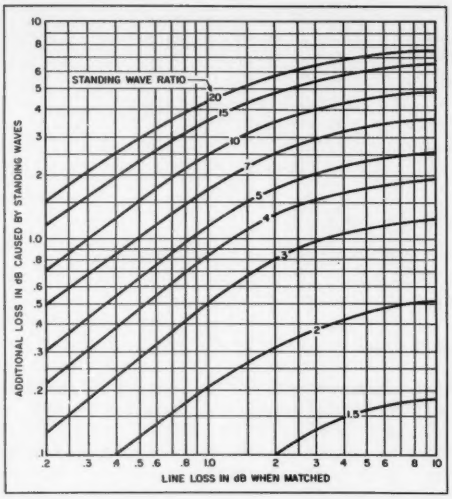

Figure 7. High SWR on a transmission line can cause significant additional signal losses.

you go to the dB figure in question and multiply the input by the number appearing under 'GAIN' or 'LOSS' to get the output. For instance, if you're running 10 watts to an antenna with a 3dB gain, your effective radiated power is 20 watts. Every 3dB your gain doubles or your loss halves. This table will give ratios.

It is well documented that in order for your signal to be heard just perceptively stronger at a distant receiver, the signal must increase by 1dB. Looking at the chart under 1dB, this means that you must effect a 26% increase in radiated power. If your radiating 100 watts and you devise a method to increase your radiated power, unless you increase it to 126 watts, your signal will not be heard any stronger by a distant receiver. So, *you* will have to weigh the benefits gained by making the changes. If you are thinking about changing your RG 8/U coax to hard line at HF, where the RG 8/U loss is 1.0dB max and the hard line loss is around 0.3dB, you've gained 0.7dB. Your signal will be no louder. And you've spent a lot of money.

Vertical Antenna

The moral of this story is that low SWR does not necessarily mean a better antenna.

Joe Ham erects a 40 meter vertical antenna. Joe Ham decides that he is going to try this thing out before he goes to the trouble of installing ground radials. What he does do is to drive an 8 foot copper clad rod into the ground at the base of the vertical. That should satisfy the ground requirements, he thinks. He tunes up and finds that his SWR is one to one. This is great and decides *not* to install ground radials. He doesn't need them. He is one to one. The reports he gets from the fringes are satisfying. Over the back fence he mentions his apparent success to his neighbor, Skippack Fats.

Now Fats knows that ground radials are needed for optimum performance and offers to help him install a set using Fat's wire and an old DeSoto hubcap as a terminating point. Fats knows that from a theoretical standpoint that about 50 radials are needed. But he doesn't have that much wire, so they install 20 radials about 50 feet long and Joe Ham tries it out. He notices that the SWR is now 2:1, and that bothers him because without the radials he was 1:1. Nonetheless, he makes some contacts and finds his reports are better with the radials installed. Joe relates his concern to Skippack Fats and Fats calls in the RF Hill Technical Committee, of which he is a principal.

The question poised to the committee was "Why does a good antenna, as determined by its low SWR, not seem to work as well as an inferior antenna with a higher SWR?"

The committee knows that a vertical over ground exhibits an impedance of 36Ω, but can be as low as 25Ω. How could Joe Ham obtain an SWR of 1:1 in a 50Ω system with no radials?

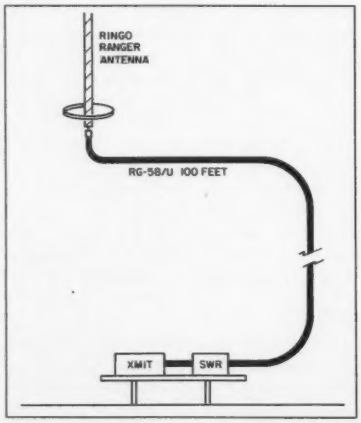

Figure 8. The VHF transmitter and antenna arrangement discussed in the text. SWR read low at the transmitter, while it was very high at the antenna feedpoint.

One of the members was able to borrow some exotic equipment from work, and with it, they determined that there was nothing physically wrong with the antenna itself. In doing so, they noticed that the ground was full of rocks and shale. With another piece of exotic equipment they measured the ground resistance parallel to one of the radials. They measured 25Ω, which is not unusual for that type of ground.

What about the ground rod at the base of the vertical?

An electrician, by trade, is a member of the committee and he knew that the ground rod was good lightning protection, shunting the power of the pre strike field deep into the earth. But for RF? Forget it. The ground currents of RF above 3MHz travel on the top inch or two of the soil and they make a bee line for the RF return at the feed point. The ground rod does nothing for RF.

Now Fats knows that antennas have two fields that are of concern to amateurs—the *near field* and the *far field*. He also knows that the far field does not enter into this situation and that the near field pattern of a vertical is like an umbrella with the tips coming down to a level even with the handle.

RF currents flow within this quasi-hemisphere to form the RF ground return. Actually, the RF currents are capacitively coupled but nonetheless, it is the RF ground return.

The following deduction was made:

25Ω antenna impedance
25Ω ground impedance
50Ω total impedance

This is what the antenna end of the 50Ω transmission line saw. 50Ω line, 50Ω terminating impedance, ergo SWR of 1:1.

When radials were added the ground currents had a clean shot to the ground side of the transmission line, essentially zero ohms. 50Ω line, 25Ω terminating impedance, ergo SWR of 2:1. SWR is figured by the simple ratio of one impedance over the other, the larger one on top.

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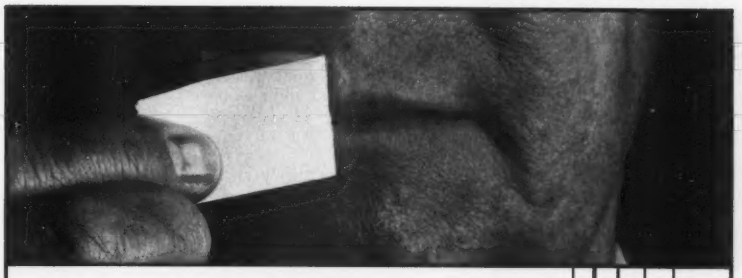

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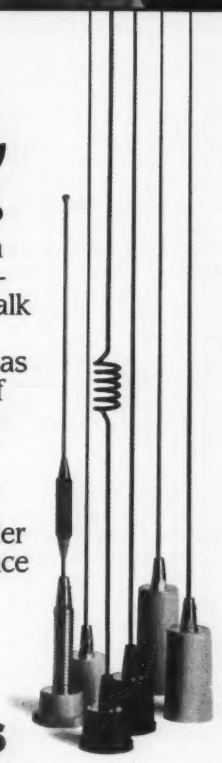

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THE ALUMINUM CLOUD ANTENNA

A top performer for cliff dwellers

by David F. Gauding NFØR

As a confirmed "cliff dweller," I have resorted to some rather desperate measures in attempts to put out a respectable signal. Fortunately, my all-band Aluminum Cloud, using standard design formulas for a center-fed zepp or the G5RV, performs consistently in a condominium attic.

Replacing traditional wire elements with aluminum foil in either 12- or 18-inch widths, produces an antenna with a massive capture area and an apparent improvement in the reception of weak signals. As a bonus, there is a significant increase in capacitance, insuring that the design loads easily use a transmatch with a balanced input.

Construction is somewhat involved, but the completed antenna can be transported and installed without difficulty or damage to the fragile elements. The materials are quite simple and inexpensive: heavy duty aluminum kitchen foil, 3/4-inch masking tape, and braided nylon fishing line, or other small diameter cord that will not stretch under tension. Two alligator clips and 300 or 450 ohm twinlead will handle the feedline requirements.

The foil should be rolled out and measured on a hard surface to insure that both sides are cut to equal length. Using a yardstick as a guide, turn up a 1-inch edge to a 90 degree angle along the full length of each element. After allowing for additional material to reach the antenna support point, lay the nylon line in the angle and fold the foil over so it is flush with the main surface. This "sandwich" is now sealed with masking tape to create a secure joint. Tape is then applied to the remaining borders on one side of each element to prevent tearing the aluminum. Finally, reinforce the foil further by applying strips of tape vertically from top to bottom at 12-inch intervals.

If each element is fabricated separately, the nylon lines should be tied together at this time to ease installation. The completed antenna may be rolled in loose coils approximately 12 inches in diameter, carried into an attic without fear of damage, and then extended in the desired location.

Illustration by Anne Vadeboncoeur

After the supporting line is tightened, the two elements will slide easily for best positioning. A 2-inch separation is adequate. If the antenna is configured as an inverted vee, the elements may overlap after installation. The foil can be folded back to avoid contact, but the preferred alternative is to make allowances while constructing the antenna by trimming the aluminum to the appropriate angle. Since the foil has been reinforced by masking tape, the feedline can be attached at either the top or bottom of the elements with alligator clips.

The attic of my townhouse peaks at 27 feet with the working area for antennas measuring 23 by 26 feet. My original 33 foot antenna is positioned on the diagonal as an inverted vee, and was designed to operate on 10, 15, and 20 meters. I was surprised to discover that it could also be resonated on lower bands, and I attributed this good fortune to the additional capacitance created by the aluminum foil. Performance on 30 and 40 meters was adequate for my purposes, though as expected, bandwidth was significantly reduced.

Later improvements included the addition of clip-on wire extensions to the foil elements. Creative positioning of these wires throughout the attic to avoid using lossy traps or coils, eventually brought the antenna up to the 102 foot length of a G5RV, while the feedline was increased to 33 feet. Most importantly, the aluminum foil continues to be located at the point of highest current, and definitely makes a favorable contribution to the performance of the final version.

The antenna, in various forms, has been used actively for over four years. With a borrowed rig, I confirmed my suspicions that it would also function effectively on 160 meters by toploading, and from the midwest I worked numerous east coast and southern stations in this experiment. With 45 watts output from a Ten Tec Argosy, my DXCC total now stands at 129 with 60 of these countries worked at QRP power levels of less than five watts. Most of this activity has taken place on 15 and 20 meters, though Europe and South America are worked regularly on 40 meters. Stateside operations on 40 and 80 meters are routine, and produced WAS-QRP during the decline of Cycle 21.

So much for the heroics at NFØR! I occasionally entertain thoughts of making all my antenna elements from aluminum foil, but recollections of crawling around the attic on all fours, accompanied by painful bruises on my balding head and tender knees, quickly put them to rest. At those times, I realize that the antenna is superior to simple wire designs, so there is not much point in trying to fix it. Having an exotic DX station answer my CQ on CW, SSB, RTTY, or packet is proof enough. 73

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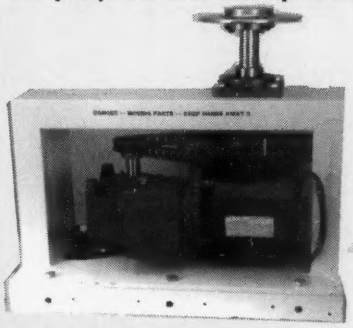

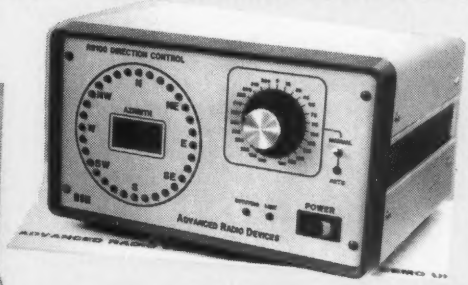

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73 Review *by Bill Clarke WA4BLC*

Butternut Butterfly Antenna

An antenna for small quarters that takes a little more work—but well worth it!

Butternut Electronics, Inc.
405 East Market
Lockhart TX 78644
Price Class: $272.50

Modern urban and suburban settings generally preclude the erection of full-size directional HF antenna systems. This relegates many hams to verticals, wires, dipoles, or compromise beam antennas.

Several months ago I assembled a Butternut Butterfly HF5B antenna and installed it on a fifty-foot push-up mast. It's a compromise antenna designed for limited space installations.

Assembly and Tuning

The antenna kit contains many parts—more than forty—that must be carefully assembled. All fastening hardware is stainless steel and all aluminum parts are properly cut and nicely finished.

The instructions are very clear. The builder must adhere to them exactly. Total assembly time was about six hours—somewhat more than the time it takes to put together a typical three-element tribander.

After completing the assembly, I put the antenna on a push-up tower so I could work on the antenna at rooftop level. This made tuning and adjusting easier. Fine tuning the antenna greatly affects front-to-back ratio and, to a lesser extent, forward gain. I made very small adjustments—just fractions of an inch at a time. Recording the initial test readings of SWR patterns and comparing them with those in the instruction manual was very helpful.

I first adjusted the antenna for 20 meters, and then for 10 and 15 meters. I spent about an hour making the final adjustments, and then raised the antenna to its operating height of forty feet.

Photo A. The many parts that make up a Butterfly antenna.

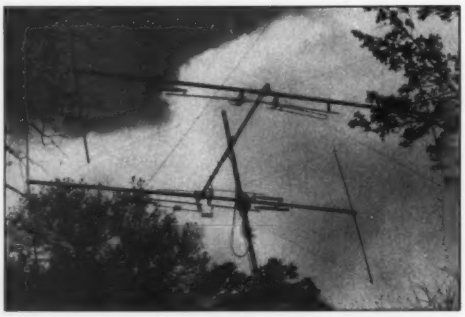

Photo B. The completed Butternut Butterfly on a push-up mast with a TV rotor. Note the extensive tuning devices used. These are what take so long to assemble and tune. It's worth it!

Operating the Antenna

I have been using the Butterfly now for six weeks and feel that it was worth all the time spent in construction and adjustment.

I compared it with a three band vertical, multiband dipole, and a three-element tribander. The only pieces of test equipment were my ears and the receiver's S-meter.

The Butterfly stood up very well to the test. It out performed the vertical and in most cases heard better than the dipole. It always put out better than either. For general use on 20/15/10 meters, I feel it's an acceptable substitute for the full-size tribander.

Observations

The Butterfly has very good front-to-back and front-to-side action. There's not a great deal of difference between its performance and the tribander's. On 20 meters, the three-element antenna consistently "talked" better than the Butterfly. The little antenna is only rated at +3 dB forward gain on this band. It's better on 15 and 10 meters at +5 dB. The full size antenna gets about 8 dB.

I didn't crush any rocks, but I did make every contact I set out to get. Maybe it's not the biggest gun in the pileups, but with a little patience, I got through. I highly recommend it for general 20/15/10 meter use. A ham can also use the Butterfly on 12 and 17 meters (as a dipole).

The small size of the antenna lets it hide well on the small push-up mast. No eyesore for the neighbors to complain about. Furthermore, it turns well even on an inexpensive Radio Shack rotor.

Initial adjustments were quite temperamental, but need be done only once.

Comments

A Butterfly installation like mine, or one with a roof mounted tripod, will usually not require a building permit or inspection. This saves money and avoids hassles with the local government.

The Butterfly is built as a compromise antenna, but it compromises the least of the typical small-space antennas. I estimate a Butterfly can be put up for about $325 using either a push-up mast or a roof tripod and a TV rotor.

If you want to crush rocks, you'll have to get a 5-element single band yagi and put it up at 100 feet. Of course, this will cost you more money than the Butterfly installation. Considering the good overall performance, the low initial cost, the lightweight hardware (mast and rotor), and the near invisibility, the Butterfly is a very good choice for a limited-space HF beam. 73

Specifications

Wingspan:	12.5 ft., 6 in.
Boom Length:	6 ft.
Turning Radius:	6.94 ft.
Vertical Spreaders:	6 ft.
Surface Area:	3 sq. ft.
Wind Survival:	80 mph
Power Rating:	1200 watts PEP
Bandwidth:	10 meters 1.5 MHz
	12 meters all
	15 meters all
	17 meters all
	20 meters 200 kHz
VSWR at Resonance:	1.5:1 or less
Gain:	10 meters +5 dB
	15 meters +5 dB
	17 meters 0 dB (used as dipole)
	20 meters +3 dB
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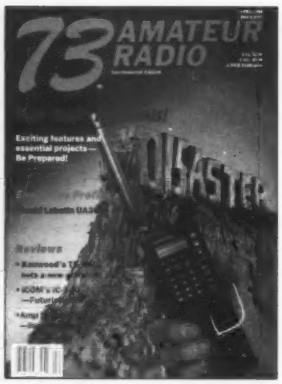

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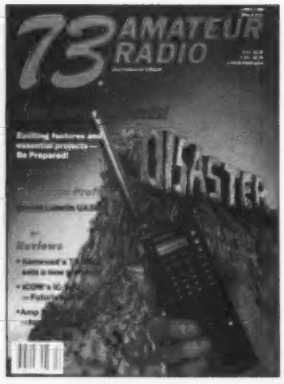

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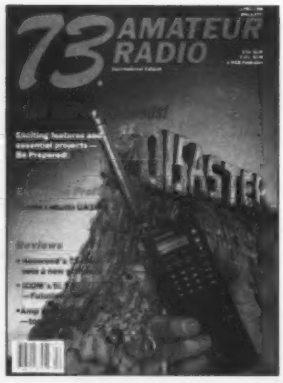

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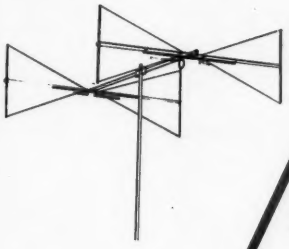

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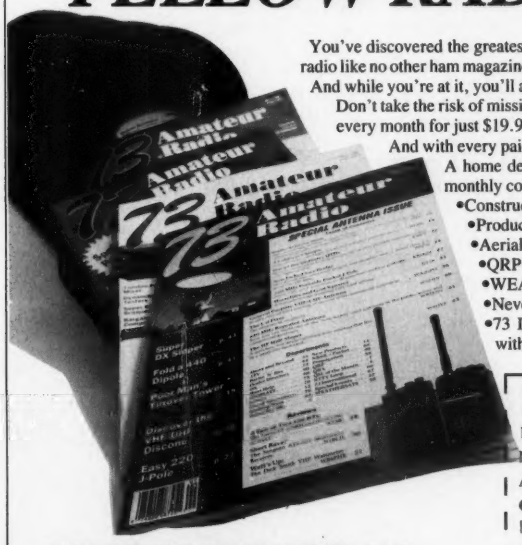

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BALLOON-SUPPORTED ANTENNAS FOR HF

How to really get out on 80 and 160 meters

by Stan Gibilisco W1GV

The idea of using a helium-filled balloon as a support for an antenna is certainly not new, but it is rarely done. Contrary to many ham's opinions, however, flying a "balloon vertical" or "balloon sloper" need not threaten either the pocketbook or human lives.

Initial Considerations

Certain things were obvious right from the beginning when I made my plans to fly a ⅝-wave end-fed antenna for 160 meters. The materials must be readily obtainable. The wire must be lightweight, conductive, and strong. There should be some provision for keeping the balloon from taking the antenna away. This last item is quite important because a long conductor, trailing from a large, lighter-than-air balloon, can be a hazard. It will eventually come down—perhaps draping the antenna over a power line.

The balloon itself has to be large enough to lift the antenna and to keep it up in a moderate breeze. I found 40-inch (about 1-meter) balloons for a few dollars that worked well for winds up to about 20 miles per hour and antenna lengths up to about 500 feet which used A.W.G. #20 (0.030-inch or 0.762-millimeter) aluminum welding wire. At higher wind speeds, stability was poor and several balloons plunged into tree branches and popped. Future plans include kite/balloon combinations to allow greater flight stability in higher winds, wind shear, gusting, and down drafts.

The most important consideration is: don't attempt balloon flight when there's any chance that the wire will hit a power line. Fortunately, I live in a neighborhood where most of the utility lines are underground. The nearest above-ground power lines are over 950 feet (290 meters) away. Allow a few percent for error in estimating the distance to a power line. I set the upper limit of my system to 900 feet (about 275 meters)—still more than a full wavelength at 1.8 MHz.

The antenna doesn't have to be any particular length, although it's best to choose a length near an integral multiple of ½ wavelength. At these lengths, the resistive component of the impedance is high, minimizing ground losses. In Figure 1, the variation of complex antenna impedance, end-fed over perfectly conducting ground, is shown for vertical antennas for increasing height. At heights less than ¼ wavelength, (the graph curve up to point A), the resistive component is extremely low. As the height increases beyond ¼ wavelength, where the resistance is about 37 Ωs, the resistance continues to increase. It reaches a maximum at ½ wavelength (at point B) of perhaps 600 to 800 Ωs. With a thin wire, the value will be very high, resulting in low ground losses with even a marginal grounding system. Matching techniques for ½-wave radiators are well known. Figure 2 shows two popular matching devices—the quarter-wave section of open-wire line and the tuned tank circuit.

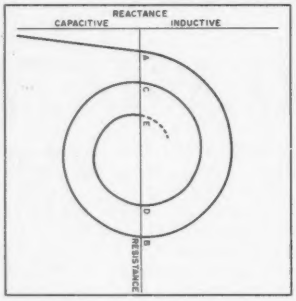

Figure 1. Reactance/Resistance relationship for an antenna from 0 to 1¼ wavelength high (point E).

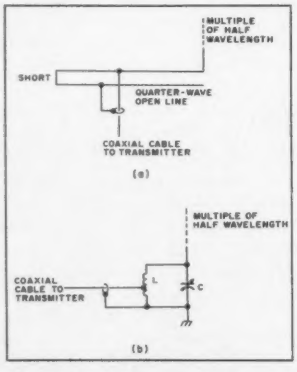

Figure 2. Two common matching systems for the balloon antenna.

Refer again to Figure 1. As the antenna length increases beyond ½ wavelength, the resistance decreases again, and reaches a minimum at ¾ wavelength (point C). This value is somewhat higher than the value at ¼ wavelength because of the extra resistance that occurs from radiation. Further increasing the height makes the resistance rise again, where it reaches another maximum at 1 wavelength (point D). Because of radiation, this value is less than the value at ½ wavelength. Continuing the increase in height produces a characteristic converging spiral in the complex R + jX plane, centered around a point on the R axis at about 180 + jO. It can be seen that the reactance alternates between capacitive and inductive, being zero whenever the antenna has a height that is an integral multiple of ¼ wavelength.

If a balloon-supported antenna is perfectly vertical, ideal heights for omnidirectional low-angle radiation are in the range of ½ to ⅝ wavelength. At 1.810 MHz, ½ wavelength is represented by 259 feet (78.8 meters) and ⅝ wavelength by 323 feet (98.5 meters). These lengths are determined by the formulas:

$L_{0.5\lambda}$ (feet) = 468/f MHz
$L_{0.5\lambda}$ (meters) = 143/f MHz
$L_{0.625\lambda}$ (feet) = 585/f MHz
$L_{0.625\lambda}$ (meters) = 178/f MHz

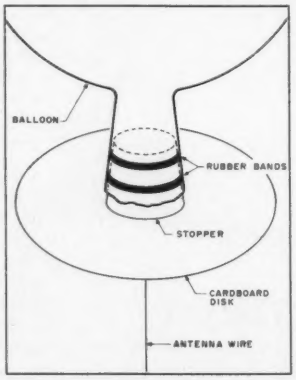

Figure 3. Stoppering the balloon after inflation. The cardboard disk acts to stabilize the balloon in winds.

Antennas supported by balloons, however, are rarely straight up and down. Even a slight wind produces considerable slanting of the antenna. If the wind is sustained over 20 miles per hour, it becomes difficult to keep a balloon antenna from breaking apart or coming down in a gust. My experience is that long wires supported by small balloons

almost always are "slopers," not verticals. Therefore, for low-angle directional propagation, lengths greater than ⅝ wavelength become quite practical and useful. To date I have flown lengths up to 830 feet (253 meters), representing about 1.6 wavelengths at 1.810 MHz.

The Basic Design

The components for the basic balloon antenna cost under $100. I left out the costs of the antenna tuner—a fundamental component for a system like this—and the ground radial system, which you should consider installing. Several radials of ¼ wavelength or greater, laid on or just under the ground, minimizes ground losses and optimizes antenna performance. Such a system also reduces RF in the shack.

The original motivation for this experiment was the 1988 CQ Worldwide 160-meter CW DX contest. I planned to fly a ⅝-wave antenna for 1.810 MHz. The wire was A.W.G. #20 (actually specified at 0.030 inch diameter) hard aluminum welding wire, uninsulated, single-strand. The height was trimmed by adjusting for minimum SWR at 3.620 MHz, the second-harmonic where the antenna would be ⅝-wave resonant and present a fairly good match to 50 Ωs (it turned out to be 1.2:1). A 110-yard (about 100-meter) roll of 20-pound monofilament fishing line was run out along with the wire to act as a backup if the wire broke. This gave a good indication of the initial length of the wire, and ensured that the antenna really was being tuned for ⅝ wavelength at 3.620 MHz and not ¾ or ⅞ wavelength.

It was necessary to trim about 20 feet (6 meters) off the line for resonance, and this seemed about right since the lead-in to the shack was 15 feet (5 meters) from the base of the antenna.

The balloon, a 40-inch display balloon, proved to be unstable in even a slight wind, so a stabilizer was added by tracing a cardboard disk around a 33⅓-rpm phonograph record and placing it at the base of the balloon as shown in Figure 3. This device acts to deflect air downward when the balloon slopes in a wind. The balloon is thereby stabilized at the angle where the upward force from the disk balances the downward vector caused by air flowing around the balloon itself (Figure 4). This results in substantial improvement in stability, with much less bobbing and dipping, and a diminished threat of the antenna coming down because of a catastrophe with a tree branch.

Even with the stabilizer, I don't recommend flying the balloon in a wind of more than 20 miles per hour sustained, as the balloon may come off the end of the wire. Two balloons were lost this way, one prior to the contest and another after one hour, nine minutes of operation at the 77th contact. At this point, the stable antenna, an 880-foot (270-meter) longwire, was used. It's always a good idea to have such a backup antenna when a balloon antenna is used, so there is something to fall back on if conditions become too adverse for balloon flight.

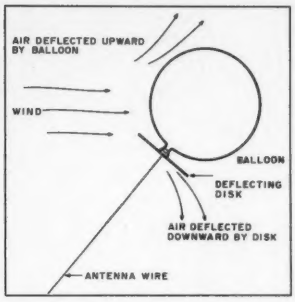

Figure 4. How the cardboard disk stabilizer serves to stabilize the balloon in winds. The upward force from the disk balances the downward vector caused by air flowing around the balloon itself.

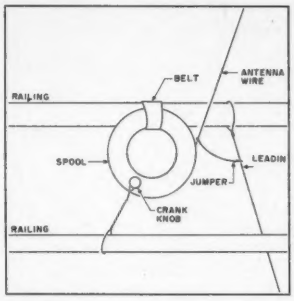

Figure 5. Base mounting scheme for the balloon antenna.

I wound the wire, along with the fishing line, onto a spool intended for utility cords. The spool provided about 18 inches (perhaps 50 cm) of length per turn and made it easy to retrieve the wire without tangling. The spool was anchored to the railing of the sundeck with a pants' belt. A wire wrapped around the railing and tied to the crank knob of the spool provided additional anchoring. The wire to the shack was clipped to the antenna wire with an alligator clip. The whole base-mounting scheme is shown in Figure 5.

Of course, you don't need to watch the balloon to know a catastrophe occurred with the system. When the wire came down shortly after the contest began, the linear let me know right away by emitting a profoundly disgusted hiss. Signals dropped off to almost nothing. The SWR on the antenna tuner skyrocketed and all operations were momentarily suspended. Conditions improved the second night of the contest.

Inflation Process

The balloons I used had necks that fit directly over the helium tank valve, without the need for a special nozzle. Rubber bands secured the balloon to the valve. Inflation was done in the garage with the door down to keep air currents to a minimum, with the cars outside and the ceiling lights off.

Take care to keep the balloon away from sharp objects like hanging shovels, rakes and brooms. I inflated the balloon slowly to keep it from blowing off the tank, and so I would not accidentally overinflate and pop it. When the balloon was properly inflated, I pinched the neck and put the stopper in it, securing the neck tightly around the stopper with rubber bands. The balloon was then tethered to a short string, using the screw hook in the stopper, and the other end of the string was tied to a 5-pound dumbbell. It is surprising how much weight a balloon this size can lift. It took a medium-sized hammer up! Be sure to use sufficient securing weight.

Bringing the balloon outside requires a tight grip on the base of the balloon as well as on the dumbbell or whatever weight is used. Slight gusts of wind will send the balloon into wild gyrations and it could easily hit a twig or the corner of the eaves and pop. As soon as the antenna wire is connected to the base of the balloon, the balloon should be let up so that it will be out of the way of the roof or low trees. Stability improves when the balloon is clear of objects that create wind turbulence. It should not be left at great heights unattended or for long periods during the daylight hours, as a mishap can occur and neighbors might get inquisitive (along with half the country if the balloon is high enough).

Determining The Best Height

This kind of antenna is especially useful on 80 or 160 meters. Normally the ⅝-wave height is best for all-around use. The length can be measured by determining the circumference of the spool, with the wire fully wound on it, and then counting the turns by feeling the knob thumping on your hand. It is important to add the length of the lead-in when determining antenna length. Don't expect exact resonance—a ⅝-wave radiator is nonresonant anyway. The reactance is tuned out by the transmatch at the station.

It's sometimes desirable to use heights greater than ⅝ wavelength. When this is done, precautions must be taken to ensure that the antenna cannot fall on a power line. There is increased risk of such problems as the wire coming down on television antennas, neighbors' cars, houses, and such things. The slope and tension will increase as the balloon is flown higher. The aluminum welding wire that I used, about A.W.G. #20, gives approximately 1200 feet (366 meters) per pound. This can be lifted by the balloon I chose, and is about as long as any wire that any ham is likely to want to use. The length of the wire will determine the cones of maximum radiation around the antenna. As the wire is made longer, the cones become sharper—that is, the angle of the apex decreases. Minor lobes also appear. A complete discussion of this subject would require a long article or book chapter all by itself, and there is simply not space here for it. Longwire antennas are discussed in *The ARRL Antenna Book*, where detailed illustrations of the maxima are given.

Considering that the maximum length of a balloon antenna is two wavelengths at 160 meters, there will not be appreciable gain resulting from the major lobes of a longwire of this size. There will be excellent low-angle radiation in some directions, however, and it may be expected that these maxima will provide superior low-angle radiation compared with any other kind of 160-meter antenna available to most amateurs. For example, a 1.5-wavelength wire at 1.810 MHz will

measure 777 feet (236 meters) and will have maxima in a double cone with apex angle about 43 degrees, and also in the plane perpendicular to the wire. If this wire flies at an angle of 43 degrees up from the horizon with a wind from the north, there will be low-angle maxima toward the North and South, and also toward the East and West (Figure 6). These result from phasing at quite high locations above the ground and will be essentially the same as if the antenna were in free space. There will be radiation at somewhat elevated angles in various directions. The actual pattern is rather complicated, but with a bit of imagination you can envision the radiation pattern in three dimensions.

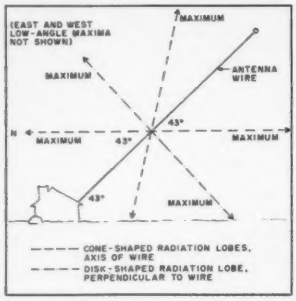

Figure 6. Radiation patterns for a 1.5 wavelength wire at 43° to the horizon. This is an excellent low-angle radiator.

We have no control over the wind direction, but we can change the length of the wire and obtain maxima at low angles in any desired direction, no matter what the wind direction. Winds do change frequently, though, and if you get very serious about balloon antenna operation you may find yourself listening to NOAA Weather Radio quite a lot. It's helpful to know when to reel in the balloon!

Again, don't forget to tether the balloon with fishing line along with the wire, so that the balloon will not be likely to take the wire with it if there is an accident.

The Impermanence of It

I have wondered why this kind of antenna is not used more often by enthusiasts of 1.8 and 3.5 MHz, and I think I have some idea. First, and quite legitimately, many hams are in areas where this kind of project is impractical and perhaps even dangerous. A trip to the country, QRP style, is an alternative in these cases. You may want to try this for Field Day on 80 meters and possibly even 40 meters. It's worth a try from a temporary location. Don't do anything that might endanger your life or someone else's life by trying this near power lines, however.

Second, this kind of antenna seems impermanent, flimsy, and even "hokey" to some because it may be brought down by mischievous winds or birds, and because it is subject to so many variables. It may even seem like cheating to use a balloon support. But it *works*. The loss rate is considerable no matter what you do, but it's still fun while it lasts.

On The Air

The first thing I noticed when I flew my first balloon—a ⅜-wave 160-meter slanting vertical—was noise. It is evidently no misconception that a wideband vertical will pick up tremendous amounts of noise, often S-9. Signals were often as high as S-9 + 30, while on my 880-foot (270-meter) longwire the signals were rarely of that caliber. Even so, it was often true that signals were readable on the longwire, with noise levels of S-2 or S-3, which weren't readable on the vertical. I therefore set up an arrangement with a separate receiver so that I could listen on the longwire while transmitting on the balloon-supported antenna.

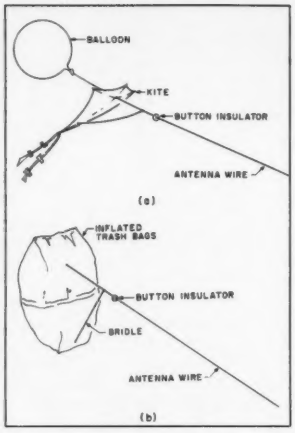

Figure 7. Several balloon antenna arrangements.

Results were immediately gratifying. I tuned up to 500 watts CW output, the most power I dared to use on that thin wire. Signal reports were quite routinely S-9-plus. It wasn't unusual to hear any report less than 589. I did not work any DX, except for the Virgin Islands, Puerto Rico and Alaska, but this is probably because I didn't have the appropriate system of beverage antennas that is best for hearing DX at 1.8 MHz. On 80 meters I easily worked JA stations, hearing somewhat better on that band with the balloon vertical since the noise level was a little more reasonable.

In the contest, stations that are well known for holding frequencies, were calling *me*. That meant the thing was getting out, even when it was flying at an angle of 35 to 45 degrees above the horizon. I used 12 radials laid under the snow, each ¼ wavelength long at 1.8 MHz. When WØAIH answered me during a run, I knew I was doing something right!

I noticed some static buildup on the antenna while it was being put up. This should be expected. Avoid shock by not touching the ground wire or lead-in before the antenna has been connected. If it snows or rains, or if the wind gets too strong, the antenna should be reeled in. It's no fun to work in constant fear of a sudden load change.

Trial and error is part of any project, but I hope this article will help you avoid some of the more common problems involved in trying to fly balloon-supported antennas. More complex projects, such as balloon-supported wire quads for 160 meters, are in the back of my mind.

Future Designs

The main problem was the wind. It is not common for many locations to be windless or near windless in the wintertime. A plain balloon will be blown down by a wind of more than about 20 miles per hour. Kites would be better under such conditions, but there is no guarantee that a kite will stay up when conditions change. It would be ideal to have a device that would fly under conditions of no wind up to perhaps 30 or even 35 miles per hour. (Wind speeds greater than 35 miles per hour are unfavorable even for the best kites.) I have heard that there is a device called a Kytoon that will serve this purpose, but I would prefer to attempt to build my own at low cost, since these flying machines seem to have a propensity for getting lost or destroyed.

The stabilizer described here is a big help, but in a gusty wind, or a wind more than 20 miles per hour, the balloon still flies very low and may hit tree branches, and get snagged, or pop. It may be necessary to use a kite for relatively windy conditions and a balloon for less windy weather, but the goal is to make a single device that will stay up in a variety of weather conditions. One idea is to attach a balloon to a small kite. In this case, it's important that the balloon be able to lift the kite, and that the kite not break because of the added wind resistance caused by the balloon. It should also be ensured that the balloon will not be popped by a pointed part of the kite. Figure 7A shows one possible arrangement.

Another idea is to use a pair of garbage bags for the balloon or, alternatively, large plastic bags from a department store. Two of the bags could be taped together using wide plastic tape, such as is shown in Figure 7B. The joint could be sealed with acrylic spray and the gas put in a hole cut in a corner of the bag. It is of a shape that might be rigged to fly as a kite, especially if fins could be attached for stabilization.

I plan to keep working on balloon supports that are more reliable and that will stay up longer. The low bands are primarily wintertime DX bands, which is fine since there are no thunderstorms in many places during the winter.

Conclusions

I thought about putting up some sort of short vertical or inverted L and forgetting about the balloon idea altogether. Such thoughts come to me when another balloon gets away—it is staggering to realize how many different ways this can happen—but nothing outperforms the ultimate, no-compromise, full-size antenna for transmitting. I'll keep the short verticals, longwires and inverted Ls for use when conditions will not permit balloon flying, but in the next 160-meter contest, you can be pretty sure that if W1GV has a big signal, the antenna is a ⅝-wave balloon vertical or a longer balloon sloper!

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Field Day Winner

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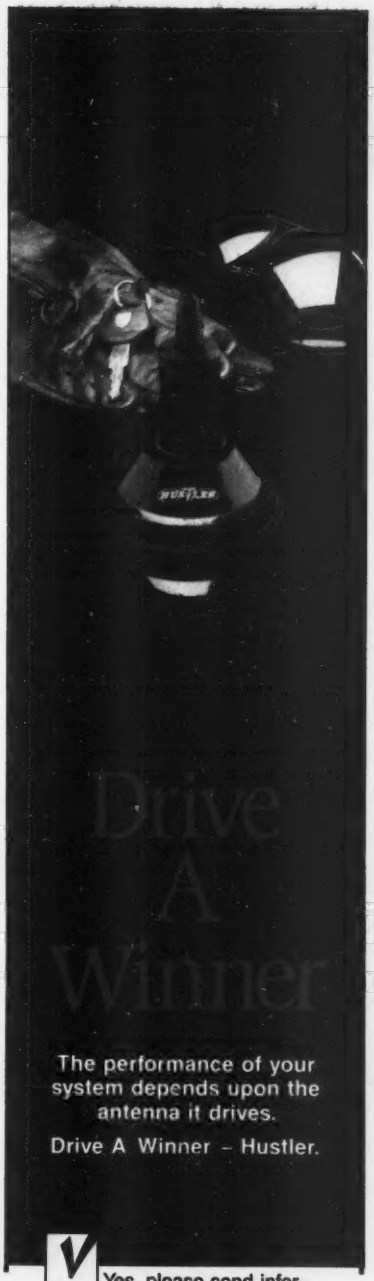

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B & W PRESENTS A WINNING COMBINATION

1500W.

MODEL PT2500A LINEAR AMPLIFIER

The Barker & Williamson PT2500A Linear Amplifier is a completely self-contained table-top unit designed for continuous SSB, CW, RTTY, AM or ATV operation. Intended for coverage of all amateur bands between 1.8 MHz and 21 MHz, it can be readily modified for frequencies outside the amateur bands for commercial or military application. Two type 3-500z glass envelope triodes provide reliability and rapid turn-on time.

FEATURES INCLUDE:

- Full 1500 watt output
- Pi-network input for maximum drive
- Pressurized plenum cooling system
- DC antenna relay for hum-free operation
- Illuminated SWR and power meters
- Vernier tuning for accurate settings
- Pi-L output for greater harmonic attenuation

Ruggedly constructed of proven design, this amplifier reflects the manufacturer's critical attention to details – such as the silver-plated tank coil for maximum efficiency. Cathode zener fuse and internal/external cooling are among the protective and safety devices employed. Input and output impedances are 50 ohms.

Dimensions: 17" wide x 19" deep x 8"½ high
Weight: 80 lbs. (shipped in 3 cartons to meet UPS requirements)

Price: $2175.00 FOB factory. Price includes one year limited warranty.

Call or write factory for complete specifications.

1500W.

MODEL VS1500A ANTENNA COUPLER

The Barker & Williamson VS1500A antenna coupler is designed to match virtually any receiver, transmitter or transceiver in the 160 to 10 meter range (1.8 to 30 MHz) with up to 1500 watts RF power to almost any antenna, including dipoles, inverted vees, verticals, mobile whips, beams, random wires and others, fed by coax cable, balanced lines or a single wire. A 1:4 balun is built in for connection to balanced lines.

FEATURES INCLUDE:

- Series parallel capacitor connection for greater harmonic attenuation.
- In-circuit wattmeter for continuous monitoring.
- Vernier tuning for easy adjustment.

Front panel switching allows rapid selection of antennas, or to an external dummy load, or permits bypassing the tuner.

Dimension (Approx.): 11" wide x 13" deep x 6" high

Weight: 6½ lbs.

Price: $499.00 FOB Factory. Fully warranted for one year.

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CIRCLE 53 ON READER SERVICE CARD

73 Book Review

On the Road Again

Tips from the best in mobile HF

Reviewed by Larry Ledlow, Jr. NA5E

The Best of HF Mobileering:
A HF Mobile Antenna Compendium
by Don Johnson W6AAQ
Published by the Author
Box 595
Esparto, CA 95627
Price: $10

Small, full-featured HF transceivers seemingly make mobile operation a snap these days . . . that is, until it's time to consider a proper antenna installation. A half-wave dipole for 75m phone simply will not fit atop anything less than a four-trailer tandem "road train" like the Aussies use to carry goods through the outback. A quarter-wave whip for 40 meters? Good luck with the power lines, underpasses, and low flying aircraft. All kidding aside, mobile HF antenna installation requires serious planning to make the most of *very* restricted real estate. Don Johnson W6AAQ brings forty years of mobile experience within easy reach through his new compendium, which makes life much easier for the new generation of "mobileers."

The 116-page compendium emphasizes automobile HF antenna installations, but mariners will find some very worthwhile points to consider for their own requirements. The author, long recognized as an outstanding authority on HF mobile operations, combines the highlights of 40 years of ham mobileering taken from his own records as well as *3995 Mobileer Newsletter*, *73*, *QST*, and *CQ*. The result is simply wonderful.

Why 40 years of HF mobileering? Believe it or not, hams were not allowed mobile operation on 80, 40, or 20 meters until 15 July 1948. Along with a select few in other parts of the country, W6AAQ, W6NTU, and W6ZIG ushered in a new age of hamming by meeting on 3995 kHz just after midnight on that date. Shortly thereafter, the San Francisco Bay area group grew to more than a dozen, and informal meetings and equipment comparisons followed.

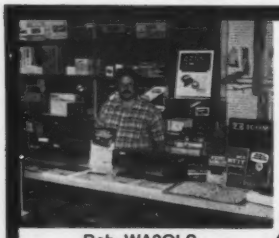
The 3995 Mobileers were born

W6AAQ begins his book with a brief history of HF mobile developments. Perhaps the old timers will remember Carter Modulation, named after Bob Carter W6NTU, that proved a much more efficient, two-tube AM transmitter than predecessors. This was just what mobileers needed. Early receivers were typically fixed-tuned converters fed into the autos' broadcast band receivers. By the early 1950s, the Gonset Super-6 tunable converter arrived on the mobile scene. With suitable modifications, the Gonset-6 could serve as a transceiver, but other equipment soon displaced it.

After his brief history of 3995 Mobileering experiences, the author moves quickly to pertinent points of mobile installation procedures and considerations. No doubt many readers will wince while reading page 8, which discusses the utility of certain devices for drilling holes in nice, shiny, new automobiles. (Don't worry, the first hole is always the hardest and most painful to drill. The rest come much more easily.) Discussions on safe power installations, coil homebrewing, multi-band antennas, field strength measurements, and much more, follow.

The second half of the book contains reprints of articles describing mobile antennas and tuners. Readers should find many of the pre-1960 ads of interest, too. Don't miss the SSB transmitter schematics dated 1954, either. Wayne Green fans will no doubt find interesting the review of the Gonset G-66 receiver. W2NSD was editor of *CQ* when that article was written (July 1956). How times change.

Don Johnson's book will help anyone, novice or expert, put together an efficient, top-notch HF mobile installation. Everyone—and I mean *everyone*—thinking about installing a mobile transceiver, from a 10m FM rig to a 100W SSB unit, should read this book. After nearly ten years of HF mobile experience, I can testify to the book's sensible approach to mobileering. I only wish Don had published *The Best of HF Mobileering* a decade ago. It would have saved me a lot of grief. 73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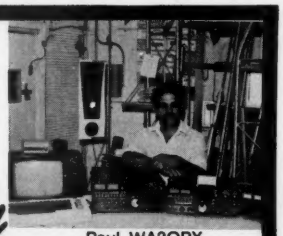
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MARS AND AMATEUR RADIO

The Military Affiliated Radio System

by Gerard J. Scarano W1ZM, NNN0WAJ

"All stations this net–All stations this net–This is NNN0NBL establising the One Hotel 3 Bravo Navy Marine Corps MARS traffic net–This is a directed net–Are there any stations with traffic?–Over." This is the voice of the Military Affiliated Radio system's MARS operator at the United States Submarine Base in New London, Groton, Connecticut, amateur radio call K1SSN operating on 4007 kHz, Upper Side Band. This net is established daily at 1900 local time for handling incoming and outgoing Connecticut traffic. Other nets on different frequencies are in process throughout the world around the clock, passing traffic by voice, CW, RTTY or even Packet.

What and Why MARS

The Military Affiliated Radio System is a Department of Defense (DOD) sponsored program, established as a separately managed and operated program by the Army, Navy, and Air Force. This article addresses Navy-Marine Corps MARS only. It is composed of licensed US Amateur Radio Stations voluntarily participating and contributing to auxiliary communications locally, nationally, or internationally as an adjunct to normal Naval Communications. Such communications are available to Military, Civil, and Disaster Officials during emergencies. High on its list of priorities is handling morale and quasi-official record and voice communications for Armed Forces and Authorized US Government Civilian Personnel stationed throughout the world. In addition, MARS creates interest, and furnishes a means of training members in Naval Communication Procedures, thus providing a potential reserve of trained radio communications personnel for military duty.

History

The US Navy's association with amateur radio dates back to the very inception of the art of wireless communications. CW operators cut their teeth on the weather reports, time signals, and notices to Mariners emitting from the Navy Station, NAA in Arlington, Virginia, and commissioned in 1913. While with the Navy in Washington, DC, I lived on South Courthouse Road, in Arlington, Virginia, two blocks from what was then the three 500-foot towers of old NAA, and on the other side, two blocks away, was the active Army station WAR with its very impressive rhombics. "It was a pleasure to operate my ham rig W4JFM with a forty-foot vertical over the remnants of the old NAA counterpoise (radials), which were still embedded in the red clay of the Virginia soil. The combination turned out to be a pipeline to DX all over the world, with only 50 watts."

The US Navy didn't take long to realize the immense potential gain by forming a close relationship with amateur radio, and assumed a policy of encouragement and support toward the amateur fraternity. Within ten days of the US entry into World War I, on 7 April 1917, 500 of the then 6,000 US amateur radio operators were enlisted for duty in the US

Photo A. Code practice.

Photo B. Lieutenant Hund operating 2 meter packet.

Navy, and before the war was over, some 3,500 more amateurs joined one of the services. In World War II over 2,500 amateur radio operators served with the Armed Forces, and many thousands more assisted in industry and research.

On 17 August 1962, The Honorable Fred Korth, Secretary of the Navy, approved a plan to establish a Navy MARS on 1 January 1963. Following this, on 30 November 1968, the Department of Defense (DOD) issued a directive formalizing the composition, mission, and function of MARS, and set policies supporting both MARS and civil amateur radio activities. I became an official Navy MARS operator in May 1966, having been an Army MARS operator before World War II.

The DOD directive concurred in the mission statements outlined at the beginning of this article, and among other things, specified: 1) It shall be our policy in MARS to support and encourage MARS and amateur radio activity within the Department of the Navy and to avoid any action which would tend to jeopardize the independent prerogatives of the individual amateur radio operator. 2) In addition we shall recognize the technical and operating proficiencies inherent in the possession of a valid amateur radio license issued by the Federal Communication Commission or other competent US authority.

MARS at the US Submarine Base in New London, Groton, CT

It was based on these two policy statements that I, upon my retirement from the Navy Department in Washington, DC, accepted the job as Custodian of the MARS/Amateur Radio Station on base. The station was then under the control of Special Services, who at one time had provided much money to buy equipment, such as the Collins "S" line and KWM-2s. However, things had deteriorated so that little of this equipment was in operating condition. The station was placed under the control of the Base Telecommunications Department. Now we are able to comply with the DOD directive's mission statements and policies.

On 20 October 1987, Captain John Cox, Commanding Officer of the Submarine Base and an amateur radio operator himself, presided over a formal ribbon cutting ceremony. Today, with refurbished operating positions, the station flashes with the latest in electronic equipment, including computers, beams, and dipoles installed from 100-foot poles and towers. There is CW voice, RTTY, and packet capability on HF, VHF and UHF. Several frequencies can be covered at one time, including a station UHF repeater on military frequencies. The membership has been restricted to active and retired military and civil service personnel. Official meetings are held on Monday evenings, but it is not unusual to find members operating any time of the day or evening.

With all this support from the Navy, the next question is, "What has this station affiliated with MARS contributed to the program?" To start with, the station is still suffering from organizational growing pains which are slowly being overcome. However, on two occasions the station has solicited additional operators from the local Tri-City Radio Club and has, as a joint effort, featured two "Special Event" weekends celebrating the arrival of the first nuclear submarine, NAUTILUS, back to its home port in Groton, Connecticut for a memorial and the dedication of the NAUTILUS Memorial and Museum. Over 2,000 contacts were made on each occasion.

Photo C. Operations K1SSN NNN0NBL.

Photo D. Custodian Jerry Scarano tuning up RTTY.

Another event is planned for early autumn 1988. Drop Boxes have been placed in appropriate spots within the base for outgoing messages. These messages are put on the air daily. Code practice and technical classes are being run weekly for those desiring to obtain an amateur license or to upgrade their license. In addition, special classes are being run for the local Sea Cadets. Periodically, FCC examinations are given. A special request is in process to handle "At Sea Traffic." Messages go from "SEND MONEY" to "MORALE BUILDING" between service persons and their families. Deaths and serious illnesses are referred to the Red Cross as a matter of policy. When not operating, special facilities are available for equipment repairs or experimental construction. Vistors are always welcome.

Eligibility to Join and Benefits to Gain

Eligibility for membership in the MARS program is restricted to the following:
1) Must be 14 years of age or older.
2) Must be a US Citizen or resident alien.
3) Must possess a valid amateur radio license issued by the FCC or other competent US Authority.
4) Must possess a station capable of operating on MARS HF frequencies. (Most commerical equipment will hit these frequencies, or will with a slight modification.)

In addition, MARS members must agree to operate in accordance with the rules and regulations governing MARS. In Navy MARS a minimum of 18 hours per calendar quarter, with 12 of the 18 hours being on Area or Region HF networks, is required.

The benefits are numerous, but the most outstanding follow:
1) Membership adds to the enjoyment of your amateur radio hobby.
2) You become part of the Navy-Marine Corps' worldwide communication system.
3) You increase your communication skills and capabilities.
4) You have may select correspondence courses in communications and electronics from MARS free as soon as you have completed six months of active membership.
5) You can operate on specially assigned military radio frequencies.
6) You will join a group of dedicated fellow radio amateurs who are participating in a meaningful public service.
7) You will gain a feeling of being associated with a military mission and of contributing to the welfare and preparedness of the nation.
8) You will be operating in regulated, disciplined radio nets with specific operating rules.
9) You will participate in the MARS Excess/Surplus Equipment Program as soon as you have served six months of active membership. Issue of equipment is based on availability.

Where To Apply

You may join Navy MARS by sending your request for application forms to:

Chief Navy-Marine Corps MARS
4401 Massachusetts Ave. NW
Washington DC 20390-5290

They will process your request through your local MARS coordinator. Good Luck and Welcome Aboard. 73

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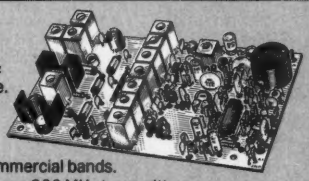
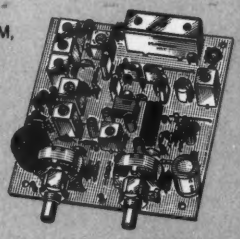


- **FM EXCITERS:** Kits $99, W/t $179. 2W continuous duty. TCXO & xtal oven options available.
- **TA51 for 10M, 6M, 2M, 150-174, 220 MHz.**
- **TA451 for uhf.**

FCC type accepted for commercial bands.

- Call for latest information on 900 MHz transmitters.
- **VHF & UHF AMPLIFIERS.** For FM, SSB, ATV. Output from 10 to 50 Watts. Several models, kits starting at $79.



- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220 MHz. **GaAs FET** front end, 0.12uV sensitivity! Both crystal & ceramic filters plus helical resonator front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere)! Flutter-proof squelch. AFC tracks drifting transmitters. Kit $149, w/t $229.
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- **R901 FM RCVR FOR 900 MHZ.** Triple-conversion, GaAs FET front end, 0.2uV sens. Kit $169, w/t $259.
- **R76 ECONOMY VHF FM RCVR** for 10M, 6M, 2M, 220. Without hel res or afc. Kits only $129.
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** Specify tuning range desired: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

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MINIATURE GaAs FET PREAMP

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GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

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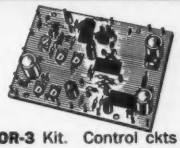

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		Antenna Input Range	Receiver Output
		26-32	144-148
		50-53	28-30
		50-54	144-148
VHF		136-138	28-30
		144-146	28-30
MODELS		145-147	28-30
Kit with Case	$59	146-148	28-30
Kit less Case	$39	220-222	28-30
Wired w/case	$89	220-224	50-54
		222-224	28-30
UHF MODELS		432-434	28-30
Kit with Case	$69	435-437	28-30
Kit less Case	$49	432-436	144-148
Wired w/case	$99	432-438	50-54
		439.25	61.25
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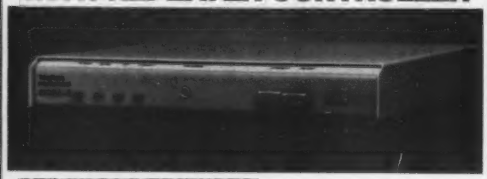

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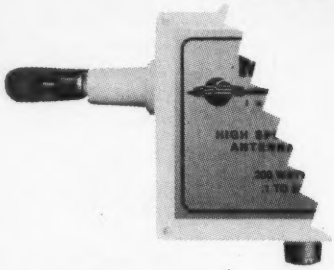

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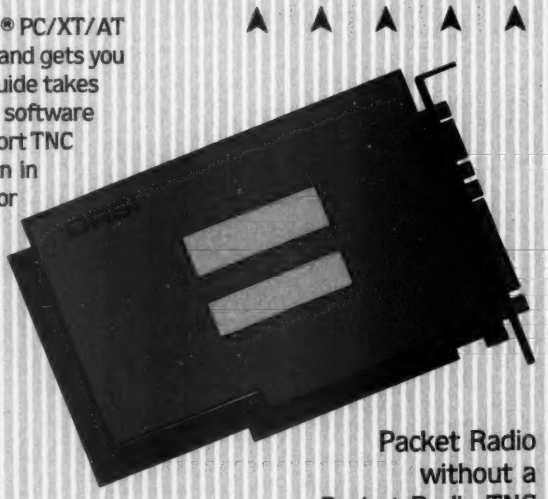
	Amateur List
PC*Packet with Software	$139.95
HF*Modem/Tuning Indicator	$ 79.95



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by L.B. Cebik W4RNL

Current Monitor

Although voltage monitoring circuits are growing more common in bench supplies, there's still little useful current monitoring. A single meter for gross current measurement provides little help for monitoring low current circuits, while a sensitive meter pegs long before the supply nears its maximum rated output. Automatic monitoring of both positive and negative current drain appears only in expensive industrial and lab equipment in the $2,500-and-up class. A simple, reliable, and effective current monitoring circuit, however, has long had a place in the data books.

The current monitor in Auto-VIM owes much to National Semiconductor's Linear Databook circuit for routinely converting current drain to a voltage output without resorting to ultra-precise resistor matching.

The sensor circuits in Figure 4 use different op amps to sense positive and negative current flow. The TL081 (or LF351) Bi-FET op amp uses P-channel inputs which work with input voltages close to the positive supply value, but fail as the input voltage approaches the negative supply voltage. By contrast, the newer TI NFET op amp, the TL091, with its N-channel inputs, shows precisely the opposite characteristics. Between the two, we obtain separate but parallel sensors for positive and negative supply currents.

The transistors, whose base current is controlled by the op amp output, control the voltage seen at the 3.3kΩ resistor. In fact, the circuits provide an output voltage per mA of line current equal to .001 times the product of R1 and R3 divided by R2. The circuit shown provides .0033V per mA, or 1.65V at 500 mA. Sensor circuit output is positive for the TL081/2N3904 combination and negative for the TL091/2N3906 duo. Although most data book circuits show FETs rather than transistors used with the FET input op amps, the bipolar transistors work better at the 5V end of the power supply range. Note the 10-turn trimmer pots marked Rb, which will receive attention during circuit calibration.

A DC amplifier follows each sensor to increase the voltage to a level desired for measurement. As with the voltage monitor, the negative amplifier inverts while the positive does not, thus yielding positive voltages for the bilateral switch. Each amplifier has a gain of 6.7 so that the metering circuit will see 12V at 500 mA, which is within the linear range of the op amps and within the switching range of the 4066. Each section of the LF353 includes an offset balancing circuit to decrease errors introduced by remnant voltage outputs.

The 4066 bilateral switch operates just as in the voltage monitor, switching in time with the positive and negative readings according to the signals from the flip-flop. One section performs another chore, that of shorting and unshorting part of the meter resistor chain as the current rises above or falls below 50 mA at the sensors. A section of a 339 comparator causes the output to change whenever the inverting input passes 1.2V. The resistor chain includes separate calibration trimmers, Rm, for each range. A 50 mA meter from Radio Shack with an internal resistance of about 2150Ω forms the base from which the other resistor values were calculated. The 1N914 and the 1.5V Zener provide meter protection.

Two of the remaining 339 sections control indicator lights which tell the user which range the meter uses. With the values shown, the circuit flips to the high range just as the needle passes the 50 mA mark, and returns at about 45 mA. The difference derives from the introduction of a small amount of hysteresis (the 5MΩ feedback resistor) to obtain good switching action with slowly changing voltages. The circuit is more than fast enough to protect itself when going from nearly no current on one polarity to nearly full current on the other. It's much faster than any mechanical or heating effects upon the meter.

Output for a digital voltmeter emerges directly from pins 4 and 1 of the 4066. If the digital meter has a three or three and a half figure readout, the builder can omit the autoranging feature and the indicator lights. This option permits using one 4066 for both monitors, since each 4066 has four independent switches per package. Set the gain of the DC amplifiers to a level giving the desired voltage per mA for the digital metering circuitry.

As with the voltage monitor, construction is not critical, and the parts fit on a 3 x 3 ½-inch perfboard backed against the voltage monitor board with four ¾ inch pillars. The squeeze is a bit tighter due to the larger sensor resistors (.22Ω at 3 watts) and the number of trimmers. Again, be sure all trimmers are accessible for later adjustment.

Calibrate the current monitor in sections, starting with the sensors. In fact, I added input and output pins for the sensors and DC amplifiers (shown as small circles in Figure 4), only connecting them together after initial adjustments. The TL081/091 op amps require careful balancing, hence the use of 10 turn pots.

Circuit output with no current load on the supply will go to zero and jump to a few volts of the opposite polarity. Set the value as close to zero as possible. Check the balance across

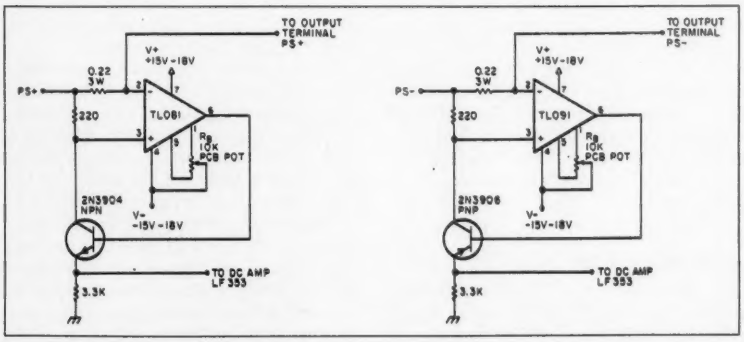

Figure 5. Schematic of the current sensors powered from the fixed supplies.

the full power range, as the remnant voltage will vary according to how well the positive and negative lines track each other. Be sure it never changes polarity for any voltage in the power supply range. Figure 5 shows a slight variation in the sensor circuits, with op amp power derived from the fixed supply. This method yields lesser remnant voltages as the power supply changes voltage, but is limited by the fact that the fixed supply and the upper limits of the variable supply are so close together. The sensor goes nonlinear as the variable supply approaches the fixed supply.

For this circuit, an 18V dual fixed supply for the sensor circuits would be ideal, although this value would exceed the limits on the CMOS chips. Hence, for the bench supply shown, powering the TL081/091 sensors from the variable supply provided more accurate readings, with a maximum remnant reading of under 2 mA at the meter.

Separately balance the DC amplifiers by grounding their input resistors and adjusting the balance trimmers, Rb, for no output. Connect the sensor outputs and adjust the gain of each amplifier, using some standard high wattage resistors to set calculable loads. A 1000Ω, 5W resistor, for example, will provide a load of 5 mA at 5V, 10 mA at 10V, and 15 mA at 15V, while a 250Ω, 5W resistor will quadruple all values. Set the comparator trimmer, Rt, for an input of about 1.2V.

Using a small load, adjust the 2kΩ meter trimmer for accurate reading at or near full scale. Using a larger load (just being sure that the meter shifts from the 50 to 500 mA scale), adjust the 20kΩ meter trimmer for accurate readings. Now monitor changing loads to be sure the meter shifts range as desired, and check that the LEDs indicate the proper range.

Although the calibration procedure is somewhat complex as such things go, it permits the building of an auto-polarity, auto-ranging circuit with common, inexpensive components. In my view, spending ham time instead of family money makes good sense.

Final Assembly

The entire supply and control circuitry fits into a cabinet 3 inches high by 5 inches deep by 8 inches wide. All controls, fit on the front panel. The fit is close, but more than adequate. The meters obviously take up the most space. For convenience, even the fuse has its front panel space.

Between the front panel and the boards, there is about an inch and a half of space for panel components and their leads. This eases final assembly, which requires a considerable number of connections to the panel and from one board to another. For low current connections, I used ribbon cable for ease of handling and the built-in color coding that reduces wiring errors. Wherever possible, I connected one end of each wire set before final assembly, taking careful notes on which color wire connected to which other terminal.

The power supply section mounts horizontally on half-inch pillars, and occupies most of the cabinet space. The monitor boards mount vertically back-to-back, separated by pillars and fastened to the case bottom with L-brackets. This technique saves space and permits easy dismounting for circuit experiments. In fact, the photos show the supply just before alteration of the voltage monitor to the circuit shown in Figure 3. To supplement the photographs, Figure 6 sketches the general layout of each board. Since construction is so non-critical electronically, any convenient arrangement should work as well as the one shown.

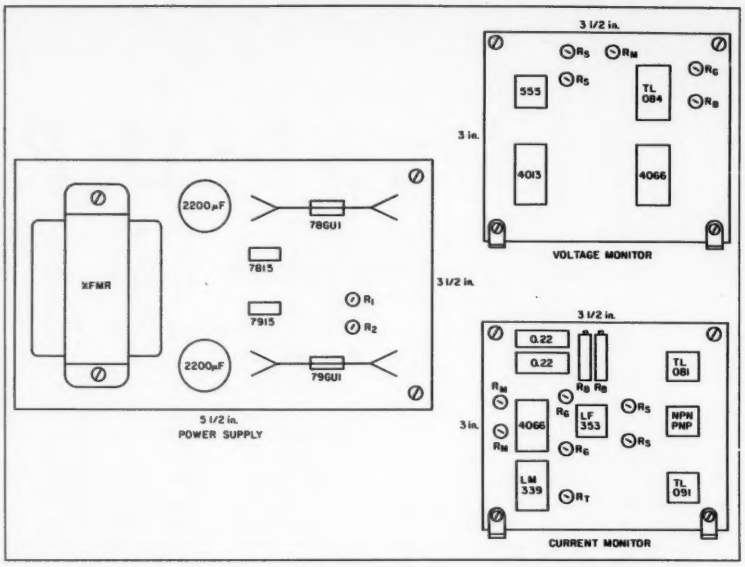

Figure 6. Board layout sketches for AUTO-VIM.

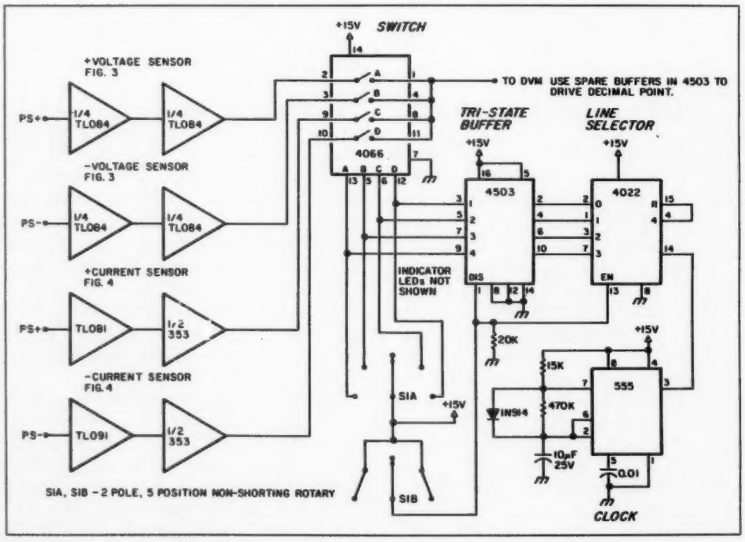

Figure 7. Schematic diagram of a one meter (DVM) auto-polarity voltage and current monitor.

A One-Meter Monitor

For some applications, a single meter may satisfy monitoring requirements. A digital voltmeter might well do voltage and current duty on a regularly cycled basis if there is a provision for manual override. A single meter permits some circuitry simplifications through a slight change of technique.

Figure 7 shows a one-meter monitor that automatically switches through both positive and negative voltage and positive and negative current readings. The 555 or 7555 clock feeds a 4022 one-of-eight selector wired for one-of-four use. Since the chip not only has eight control lines, but can be sequenced to others as well, cyclical monitoring over many values becomes easy. Connecting the fifth output (or the one after the last one used) to the reset line gives instantaneous return to the first line, restarting the cycle without interruption.

To permit manual override, the signals

from the selector pass through a tri-state buffer, the 4503. Normally, the selector enable pin (13) and the buffer disable pin (1) are at ground (through a 20kΩ resistor). Under these conditions, the meter cycles automatically. The two-pole, five-position non-shorting rotary switch establishes these conditions in its center position. At any other position, the disable and enable pins go High, interrupting the cycle. The switch also sends the desired 4066 switch control pin High, thus holding the meter on this reading until the switch is returned to the center position. The 4503 outputs will also support indicator LEDs with 1.5kΩ series resistors without further buffering.

The sensors appear only in outline form, since they are identical to those in Figures 3 and 4. Since the TL084 and the LF353 are quad and dual op amp versions of functionally the same circuitry, one can interchange positions for all but the two current input sensors. For this application, separate DC amplifiers for each of the voltage sensors are preferable, since they permit separate calibration of both positive and negative voltage monitors. The 4066 output can drive any analog or digital meter. The only necessary variations will be in amplifier gains to supply acceptable signal levels to the metering circuits.

The monitoring circuits we have looked at are expandable in many directions to serve a large number of monitoring needs. Adding current monitoring to the more common voltage monitoring provides an especially helpful dimension to the average bench supply in the ham shack. Since the whole supply should cost no more than about fifty dollars, including a case and two meters (almost half the cost), there's no good reason why every ham shack should not have a supply with all the benefits of automatic voltage and current monitoring. AUTO-VIM will certainly earn its keep. Having used it for only a few months, I have already recovered its cost in parts I did not burn up. I can now spot trouble before my nose tells me it is too late.

[Part 1, including Figures 1–4, was published in the August issue.]

PARTS LIST

Dual Power Supply

Quantity	Part	Source
1	18V, 2 amp transformer	All Electronics
1	½ amp fuse and holder	RS 270-364
1	SPST toggle switch	RS 275-662
1	Line cord	
6	1N4001 50 PIV diode	RS 276-1101
1	78GU1 variable positive voltage regulator	Circuit Specialists
1	79GU1 variable negative voltage regulator	Circuit Specialists
1	7815 +15V regulator	Circuit Specialists
1	7915 −15V regulator	Circuit Specialists
2	2200 µF, 35V electrolytic capacitor	RS 272-1020
2	.1 µF, 35V tantalum capacitor	Digi-Key
1	.22 µF, 35V tantalum capacitor	Digi-Key
2	1 µF, 35V tantalum capacitor	Digi-Key
1	2.2 µF, 35V tantalum capacitor	Digi-Key
1	2 section linear potentiometer, 10kΩ /section	Circuit Specialists
2	500 Ω PC board trimmer pot	Digi-Key
2	1.5kΩ, ¼W resistor	
1	2kΩ, ¼W resistor	
1	4.2kΩ, ¼W resistor	
2	4.7kΩ, ¼W resistor	
2	5.6kΩ, ¼W resistor	
1	LED and panel mount	Jameco
2	Heatsinks for TO-202/TO-220 cases	Digi-Key
1	Cabinet: 3 ½ x 7 ⅛ x 5 ¾ inches	RS 270-269
	Perfboard	
	Mounting posts and hardware	
	T46 or similar connection pins	

Voltage Monitor Parts

No.	Part	Source
1	TL084 quad BiFET op amp	RS 276-1714
1	4066 bilateral switch	Digi-Key
1	4013 dual D-type flip-flop	Digi-Key
1	555 or 7555 (CMOS) timer	Digi-Key
1	0 to 15 voltmeter with external series resistor	RS 270-1754
3	.01 µF, 50V disc capacitors	Jameco
1	2kΩPC board trimmer pot	Digi-Key
2	10kΩPC board trimmer pot	Digi-Key
2	100kΩPC board trimmer pot	Digi-Key
1	100 Ω, ¼W resistor	
2	1kΩ, ¼W resistor	
1	9.1kΩ, ¼W resistor	
3	15kΩ, ¼W resistor	
2	20kΩ, ¼W resistor	
2	75kΩ, ¼W resistor	
6	100kΩ, ¼W resistor	
1	150kΩ, ¼W resistor	
1	470kΩ, ¼W resistor	
2	LED and panel mount	Jameco
1	SPDT Center off toggle switch	RS 275-664
1	8 pin DIP socket	
3	14 pin DIP socket	
-	Perfboard	
-	Posts and hardware	
-	T46 connection pins	
-	Ribbon cable	

Current Monitor Parts

No.	Part	Source
1	TL081 P-channel BiFET op amp	RS 276-1716
1	TL091 N-channel NFET op amp	RS 276-1745
1	LF353 dual BiFET op amp	RS 276-1715
	4066 bilateral switch	Digi-Key
1	LM339 quad comparator	RS 276-1712
1	2N3904 NPN transistor or equivalent	RS 276-1603
1	2N3906 PNP transistor or equivalent	RS 276-1604
1	1N914 silicon diode	RS 276-1122
1	1.5V Zener diode	Digi-Key
1	50 microammeter	RS 270-1751
1	5kΩ PC board trimmer pot	Digi-Key
1	10kΩ PC board trimmer pot	Digi-Key
2	10kΩ, 10 turn trimmer pot	Jameco
1	20kΩ PC board trimmer pot	Digi-Key
4	100kΩ PC board trimmer pot	Digi-Key
2	.22 Ω, 3W 5% resistor	All Electronics
2	100 Ω, ¼W resistor	
2	220 Ω, ¼W resistor	
2	1.5kΩ, ¼W resistor	
2	3.3kΩ, ¼W resistor	
1	7.5kΩ, ¼W resistor	
3	10kΩ, ¼W resistor	
1	20kΩ, ¼W resistor	
1	91kΩ, ¼W resistor	
10	100kΩ, ¼W resistor	
1	220kΩ, ¼W resistor	
1	510kΩ, ¼W resistor	
1	620kΩ, ¼W resistor	
1	5 MΩ, ¼W resistor	
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	Perfboard	
	Posts and hardware	
	T46 connection pins	
	Ribbon cable	

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THE PEE WEE THIRTY TRANSCEIVER

A compact 30 meter CW/AM QRP transceiver (Part I)

by Dan Eggert AC9E

The one thing about amateur radio I've always liked best was the challenge of building my own equipment. Here's a little 30 meter QRP transceiver that has certainly brought a lot of fun back into amateur radio for me lately, and I hope to share some of the fun with you!

My family goes camping nearly every weekend possible during the warmer Wisconsin months, and I thought that it would be great to have a portable rig to set up at the campsite. The 30 meter band appealed to me since I prefer CW, and the barefoot restriction on the band makes it attractive for QRP operation. I have since designed 40 and 20 meter versions, details of which I will gladly provide for an SASE.

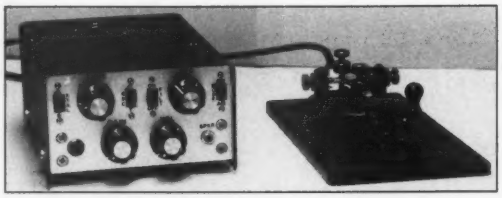

Photo A. The 30 meter Pee Wee transceiver and keyer.

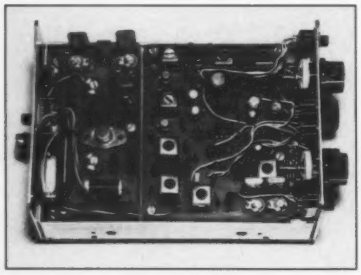

Photo B. The internal view of the QRP transceiver.

My first unit was built on a perf board, it was only one frequency, and it did not have a CW filter. After the first few QSOs, I decided the receiver needed some sort of CW filter, so I built a two-stage audio active filter on a seperate small perf board and stuffed it into the rig where I could find some room. I'm embarrassed to show anyone the inside of my first unit, because it was a real rat's-nest of modifications. It performed very well, however, and I was very surprised at what a couple of watts of output power can do! After several comments on the transmitter's signal quality, and some requests for construction plans, I then designed a printed circuit board and cleaned up the rat's nest!

The rig is very simple and a bit of a challenge to operate, especially for those accustomed to all the automation of big rigs. The receiver is quite sensitive, but it only has a manual gain control, and a simple two stage 800 Hz CW audio filter. The transmitter and receiver are crystal-controlled for stability, but the receiver is also tunable, so the rig can double as a WWV monitor.

Simple, Inexpensive Design

The transmitter and receiver can be built separately, because they don't share components. They are actually two separate circuit boards joined together. The builder can put together the receiver alone as a WWV monitor, or for some other specific frequency.

I made a special effort to keep things simple and inexpensive. I also tried hard to avoid the coil winding, to keep from discouraging some project builders. With some experimentation, I found that 10.7 MHz IF transformers in the RF preamp and oscillator circuits of the receiver worked adequately at 10.1 MHz. All transformers used in the receiver were inexpensive and readily available from Mouser Electronics. The transmitter has a transformer and coil that have to be wound, but they are simple to build (see construction notes).

The side tone during transmit is obtained by leaving the receiver on and lowering its gain by removing power to the preamp and gain control potentiometer. A great way to monitor your own signal! When the rig's NiCds start to die, I hear a sudden slide in the side tone frequency. A loose connection in the antenna or feed line shows up as an abrupt shift in side tone frequency and/or amplitude due to a load change.

Except for the audio output stage, the receiver's circuit designs come from the 1977 *Radio Amateur's Handbook*. It's a single conversion superhet with a 455 kHz IF. It has two local oscillators, a two-frequency, crystal local oscillator, and a tunable local oscillator. The oscillators are zener-regulated for better stability. Their outputs are in series, and are selected by switching power back and forth between them. There's also an AM/CW mode switch. With the tunable AM mode, WWV can be tuned in at 10 MHz. It tunes the entire 30 meter band, which contains many shortwave broadcasts.

The receiver's preamplifier and two IF amplifier stages make it quite sensitive, and a manual gain control is incorporated as a basic necessity. The simple but effective 455 kHz variable BFO provides a means of CW tone adjustment from the receiver's front panel. The BFO's power input is zener regulated for stability, but some power-up drift is noticeable and minor adjustments are occasionally needed. The two stage 800 Hz audio active CW filter can be switched in when the band gets congested. My junk box had an abundance of small low capacitance panel mounted variable capacitors in it, so I designed the printed circuit board with them in mind. These variable capacitors may be expensive and hard to find, so I devised a simple circuit using varactor diodes for frequency control of the tunable local oscillator and BFO.

The LM-386 audio output IC provides plenty of audio output to a set of headphones, or a small speaker. I measured a receiver current drain of approximately 40 milliamps when using a 12-volt bench supply and receiving a moderate signal. (This is a very simple bare-bones receiver!) While listening to a received signal, or the transmitter's sidetone, the listener hears a mirror image as the BFO is adjusted through each side of zero beat. He must make a quick check before replying to a CQer by rotating the BFO knob slightly to see if he is actually on another listener's operating frequency!

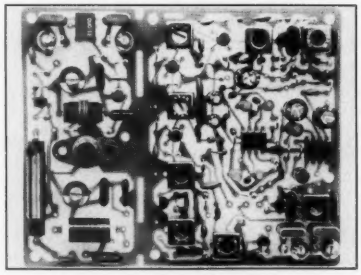

Photo C. Parts placement.

The transmitter consists of a two frequency crystal controlled oscillator, a keying transistor, and a power output final. A steady, chirp-free, CW tone is achieved by keying the oscillator stage and leaving power applied to the output final during transmit. R3 and C4 in the keying circuit provide good rise and decay times for proper CW signal shaping. The keying transistor stage simplifies the interfacing of an electronic keyer or a computer.

The transmitter printed circuit board layout has pads to accept a Radio Shack 275-241 relay used for the transmitter's crystal frequency switching. One set of contacts of a DPDT switch changes crystal frequencies in the receiver's crystal local oscillator, while

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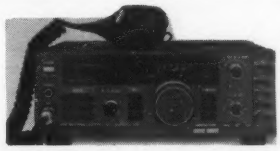

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MRF245	27.50	2N2642	13.75
MRF247	26.00	2N2643	15.00
MRF260	7.00	2N5945	10.00
MRF262	8.75	2N5946	12.00
MRF264	10.50	2N6080	6.25
MRF317	56.00	2N6081	8.00
MRF421	24.00	2N6082	9.50
MRF422	36.00	2N6083	9.75
MRF428	50.00	2N6084	11.50
MRF433	11.00	2SC730	1.25
MRF499,/A	12.50	2SC1307	3.00
MRF450	13.50	2SC1946,/A	15.00
MRF453	15.00	2SC1947	9.75
MRF454	14.00	2SC1969	3.00
MRF455	11.75	2SC2075	3.00
MRF458	20.00	2SC2097	28.00
MRF460	44.00	2SC2166C	3.50
MRF475	3.00	2SC2290	16.75
MRF476	2.75	2SC2312	4.95
MRF477	11.75	2SC2509	9.00
MRF479	10.00	2SC2630	28.00
MRF485 *MP-KEN*	18.00	2SC2640	15.00
MRF492	16.00	2SC2641	16.00
MRF497	14.25	2SC2879	22.00
MRF515	2.50	3N204	2.00
MRF555	3.00	3N211	2.00
MRF607	2.50	40582	7.50
MRF630	4.25	*OUTPUT MODULES*	
MRF641	18.00	SAU4 *450 MHz*	55.00
MRF644	21.00	SAU17A *903 MHz*	50.00
MRF646	25.00	SAV6 *150 MHz*	42.50
MRF648	31.00	SAV7 *146 MHz*	42.50
MRF660	10.75	SAV12	23.50
MRF837	2.25	SAV15 *222 MHz*	48.00
MRF843	22.50	M57712,M57733	use
MRF846	37.75	M57737, SC1019	SAV7
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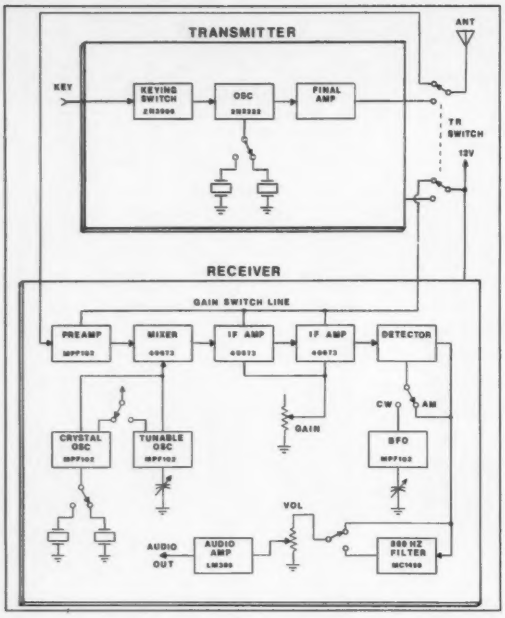


Figure 1. Block diagram of the Pee Wee 30 transceiver. The transmitter and receiver sections are on separate boards.

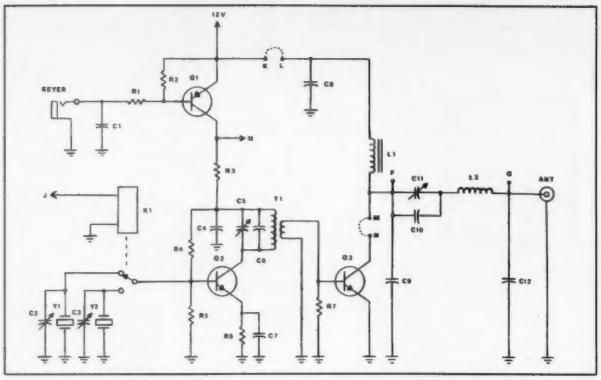


Figure 4. Schematic for the transmitter section of the Pee Wee 30.

the other set of contacts switches the relay on the transmitter board. Without this relay, separate switches are needed in the receiver and transmitter for the crystal switching. My choice of output final transistor was simply a matter of which junk box transistor worked best! With a 2N3053 transistor in the output final stage, and a bench power supply set to 12.5 volts, an input power of 2 watts was measured.

I found that a 2SC777, which is used in CB transmitters, gives good output power, and needs no heat-sinking due to its large surface area. I calculated a healthy 3 watts of input power to the transmitter final with the 2SC777 installed. This transistor, however, may not be easy to find.

CONSTRUCTION NOTES

Figures Overview

Figure 1 shows a functional block diagram of the transmitter and receiver as separate circuits, and the simple connection between them to form a transceiver. The receiver schematic is divided into two separate drawings, Figures 2 and 3. Points A and B are direct connections between the two receiver schematics.

Figure 4 is the transmitter's schematic diagram. When built as a transceiver, a DPDT switch takes care of the transmit/receive switching. I put this switch on the rear of rig up high where it's easy to reach. One half of the switch is used for switching the antenna to the receiver and transmitter. The other half switches 12 volts to the receiver's gain control line during receive, and supplies 12 volts to the transmitter during transmit.

Receiver

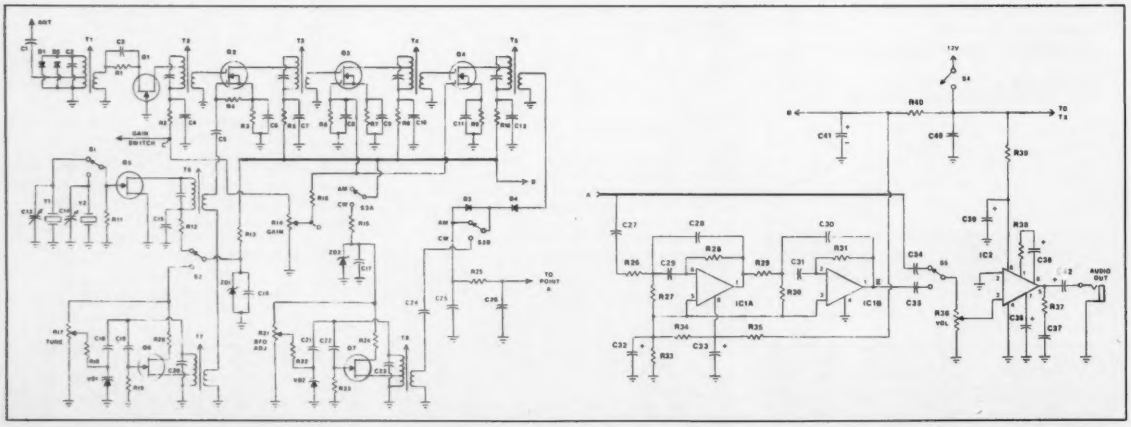
You must remove the internal capacitor from transformer T1. Disassemble the transformer and cut the leads carefully with a sharp knife, and pull the capacitor out through the bottom. Take care to not cut the leads of the transformer windings! Capacitor C2 on the circuit board will now determine the tuning range of this transformer.

You must remove a lead from transformers T4 and T5 before installing them on the PC board, because there are no holes provided for them. Transformers T6 and T7 have a mounting tab on their shield cans that also must be removed. Figure 6 illustrates which leads and tabs to remove. Again, careful around the transformer winding leads!

Capacitors C34 and C35 are not mounted on the PC board. They must be connected between the PC board and switch S5. My first rig had only one capacitor, which was placed between S5 and the volume control R36. That arrangement produced a pop in the earphones when the filter was switched in and out.

If you choose to use varactor tuning instead of variable capacitors in the receiver's tunable local oscillator and BFO circuits, then you must make some component connections off of the PC board. This is necessary

[Figure 5 (A), the PC board trace, is continued on page 85.



Figures 2, 3. Schematic for the receiver section of the Pee Wee 30. Points A and B are where the two schematics join together.

30 Meter Receiver Parts List

Capacitors	C1	100 pF Ceramic Disc
	C2	22 pF Ceramic Disc
	C3,C4,C15	.022 µF Ceramic Disc
	C5	39 pF Ceramic Disc
	C6-C12	.047 µF Ceramic Disc
	C13,C14	4-34 pF trimmer 7mm
	C16,C17,C40	.1 µF Ceramic Disc
	C18,C21	47 pF Silver Mica *
	C19	120 pF Silver Mica
	C20	33 pF Silver Mica
	C22	820 pF Silver Mica
	C23	82 pF Silver Mica
	C24	.01 µF Ceramic Disc
	C25	.0047 µF Ceramic Disc
	C26,C27	.01 µF 50 VDC Monolythic
	C28-C31	1000 pF 50 VDC Polystyrene Radial
	C32,C33,C36,C38	10 µF 16 VDC Electrolytic Radial
	C34,C35	.22 µF 50 VDC Monolythic *
	C37	.047 µF 50 VDC Monolythic
	C39,C42	220 µF 16 VDC Electrolytic Radial
	C41	100 µF 16 VDC Electrolytic Radial
Resistors	R1	270
	R2,R5,R8,R10, R12,R20,R24	120
	R3,R35	560
	R4,R16,R19,R23	100k
	R6	33k
	R7,R9	390
	R11	47k
	R13,R15	220
	R14,R17,R21	10k pot, linear taper *
	R18,R22	47k *
	R25	1.5k
	R26,R29	680k
	R27,R30,R33,R34	24k
	R28,R31	1.8M
	R32	Skipped
	R36	10k pot with switch *
	R37	10
	R38	1.2k
	R39	150
	R40	68
All resistors are ¼ Watt 5%		k = 1,000Ω M = 1,000,000Ω
Transformers	T1,2	10.7 MHz Green
	T3	455 kHz Yellow
	T4	455 kHz White
	T5	455 kHz Black
	T6	10.7 MHz Blue
	T7	10.7 MHz Orange
	T8	455 kHz Black
Crystals	Y1,Y2 = (TX freq. – 455 kHz) HC/25U 30 pF 0.0025 tol.	
Diodes	D1,D2	1N914
	D3,D4	1N34
	VD1,VD2	ECG612 *
	ZD1,ZD2	1N754
Transistors	Q1,Q5-Q7	MPF102
	Q2-Q4	40673
ICs	IC1	LM1458
	IC2	LM386
Switches	S1-S3,S5	miniature DPDT slide switch *
	S4	part of volume control R36 *

*Parts not mounted on the PC board.

Table 1.

because the PC board was designed to use variable capacitors for tuning, and varactor tuning was an afterthought.

The point where VD1, R18, and C18 connect in the tunable local oscillator circuit, and the point where VD2, R22, and C21 connect in the BFO circuit must be made above the board. Solder the anode ends of the varactor diodes VD1 and VD2 in the holes at ground potential of the transformer windings, and stand them up. Solder the 47 pF mica capacitors C18 and C21 in the holes at the ungrounded side of the transformer windings, and stand them up. The other end of the 47 pF mica capacitors and varactor diode cathodes, and one end of the 47 kΩ resistors R18 and R22 are connected above the board. These components should be secured to the side of the transformers with some glue to keep the oscillators from shifting due to mechanical shock or vibration.

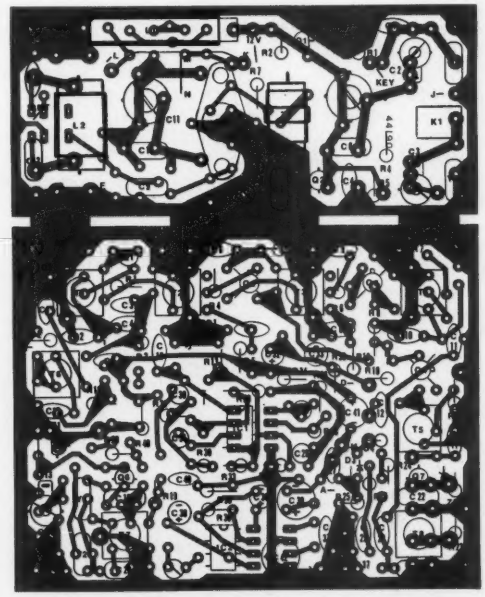


Figure 5 (B). Parts placement of the 30 meter transceiver.

The voltage for the BFO's tuning potentiometer R21 is obtained by a connection at the cathode of zener diode ZD2, either above or below the PC board, whichever you prefer. The voltage for the tunable local oscillator's tuning potentiomer R17 is obtained by a connection at the switched side of R20 in the same manner.

If you have variable capacitors and wish to use them for tuning, then omit the 47 pF capacitors C18 and C21, the varactor tuning diodes VD1 and VD2, the 10k potentiometers R17 and R21, and the 47kΩ resistors R18 and R22. Place the variable capacitor in parallel with C20 in the tunable local oscillator

Receiver Parts Acquisition

C13,C14	Mouser 24AA113
C18,C21	Jameco DM15/470
C19	Jameco DM15/121
C20	Jameco DM15/330
C22	Jameco DM15/821
C23	Jameco DM15/820
C26,C27	Jameco MD.01/50
C28,C31	Mouser 23PW210
C32,C33,C36,C38	Digikey P6023
C34,C35	Jameco MD.22/50
C37	Jameco MD.047/50
C39,C42	Digikey P6228
C41	Digikey P6227
R14,R17,R21	Mouser 31CN401
R36	Mouser 31CQ401
T1,T2	Mouser 42IF126
T3	Mouser 42IF101
T4	Mouser 42IF102
T5	Mouser 42IF103
T6	Mouser 42IF129
T7	Mouser 42IF124
T8	Mouser 42IF106
Y1,Y2	Jan Crystals Crystal Sockets Jan Crystals CE25
D1,D2	Jameco
D3,D4	Mouser
ZD1,ZD2	Jameco
Q1,Q5-Q7	Jameco
Q2-Q4	Jameco
IC1,IC2	Jameco
S1-S3,S5	Radio Shack

Table 2.

DIGI-KEY PO Box 677 Thief River Falls MN 56701 (800) 344-4539	Mouser Electronics 2401 Hwy 287 North Mansfield TX 76063 (817) 483-4422
Jameco Electronics 1355 E. Shoreway Road Belmont CA 94002 (415) 592-8097	Jan Crystals 2400 Crystal Dr. PO Box 06017 Ft. Myers FL 33906-6017 (800) 237-3063

Table 3.

circuit, and C23 in the BFO circuit. Very little capacitance is needed. I used variable capacitors with an approximate tuning range of 5–10 pF and they were very adequate.

Transmitter

There are two wire jumpers on the transmitter board that have to be installed. As shown on the transmitter's schematic, Figure 4, there's a jumper from points M and N in the collector circuit of the transmitter final, and a jumper from points K and L which connects the 12 volt power input between the keying and final stages. Don't forget them!

When built as a transceiver, Point J on the transmitter schematic is switched 12 volts, brought over from the unused section of the receiver's crystal selector switch S1. I placed a 0.1 µF capacitor across these switch contacts in my second rig to kill the annoying pop in the earphones during frequency switching.

I used HC/25U, 30 pF, 0.0025 tolerance crystals in the receiver and transmitter, ordered from Jan Crystals. This type of crystal works well in the receiver. When this type of crystal is used in the transmitter however, they will oscillate approximately 2 kHz lower than their actual frequency. After discovering this problem during the tune up of my first unit I have since been ordering crystals cut for 2 kHz above the desired transmitter frequency.

Transmitter transformer and coil construction is fairly simple. For coil form material, I purchased some small PVC plastic tubing at the local hobby shop. I then stripped wire from an old unused coil in my junk box. For transformer T1, use a coil form with an ¼" outside diameter. Drill two small holes

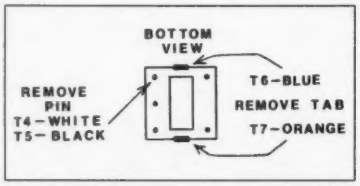


Figure 6. In the receiver, you must remove one pin from both T4 and T5, and one tab from T6 and T7.

through the coil form 13.32" apart with a very small drill bit, like the one that drilled the PC board holes. Thread a couple of inches of #26 gauge enameled wire through one hole, and then tightly wind 23 turns to the other hole. Cut the wire, leaving a couple of inches to thread through the remaining hole. Place some heat shrink tubing over the coil to secure it. For T1's secondary winding, wrap four turns of some small gauge insulated hookup wire tightly around the primary coil before installing it on the PC board. L2 is made the same way as the primary of T1. Use a coil form with a 5.16" outside diameter. Drill the small holes ⅜" apart, and wind it with 27 turns of #24 gauge enameled wire.

Photo B shows the inside of my first rig. All of the front panel controls were mounted as close to their associated circuitry as possible. The PC board, measuring 3.8" x 4.7", can easily fit into one of the many cabinets available, like Radio Shack's 270-252A, which is 4 x 2⅜ x 5⅞. I made my own cabinet, but used the top portion of the Radio Shack cabinet because it's made of steel, and it has a nice paint job. My chassis also opens from the bottom for easy servicing. Ten AA NiCds, which sit in the chassis bottom, power the rig.

Options

To omit one of the local oscillators from the receiver circuit, place a jumper on the circuit board where the secondary of the unused oscillator transformer normally is. This is necessary to complete the circuit path for the mixer's local oscillator injection input.

Those who just want AM for monitoring WWV can omit the BFO circuitry and place a jumper where diode D3 is normally installed.

The relay on the transmitter PC board draws an extra 37.5 milliamps of current drain when energized, shortening battery operation time. If a switch is substituted for the relay in the transmitter for frequency switching, then it should be placed as close to the crystals as possible to keep the lead lengths short.

20/40 Meter Operation

The Pee Wee 30 is easily modifiable to 20 and 40 meters. The builder need only change the number of turns in the coils, the values of fixed capacitors C6 and C10, which are in parallel with the trimmer capacitors, and, of course, the crystal frequency. Some experimentation is necessary. I provided extra holes on the transmitter board to accomodate a smaller RF choke in the final circuit, and extra holes for a different size output coil. You can use any transformers with the proper lead spacing in the receiver's front end and oscillator circuits.

Those wishing to wind their own coils for another band should look to Amidon Associates' L43 series coil forms. They have the proper lead spacing. I have stripped the 14 turns of wire from the tuned side of a 10.7 MHz transformer used in the receiver preamp and replaced it with 20 turns of #32 gauge wire. The transformer's new tuning range was from 6–8 MHz. ■

(Part II: Alignment and Testing)

30 Meter Transmitter Parts List

Capacitors	C1	.022 µF Ceramic Disc
	C2,C3	4–34 pF trimmer 7MM
	C4	.22 µF 50 VDC Monolythic
	C5,C11	16–100 pF trimmer 10MM
	C6,C10	47 pF Silver Mica
	C7,C9	220 pF Silver Mica
	C8	.1 µF Ceramic Disc
	C12	330 pF Silver Mica
Resistors	R1	2.7k
	R2	10k
	R3	47
	R4	27k
	R5	10k
	R6	470
	R7	47
Transistors	Q1	2N3906
	Q2	2N2222
	Q3	2N3053 or 2SC777
Crystals	Y1,Y2 (TX freq. @ 2 kHz)	HC/25U 30 pF .0025 tol. **
Relays	K1	SPDT 12 VDC Coil PC mount
Coils and Transformers	L1	100 µH RF choke
	L2	27 turns of #24 ga. enameled wire closely wound on a 5.16" coil form.
	T1	23 turns of #26 ga. enameled wire closely wound on a ¼" coil form, then heat shrink over the coil.

The secondary winding is four turns of small insulated hook up wire which is wound over the heat shrink tubing

**See construction notes on transmitter crystals.

All resistors are ¼ watt 5% tolerance

Table 4.

Transmitter Parts Acquisition

C2,C3	Mouser 24AA113
C4	Jameco MD.22/50
C5,C11	Mouser 24AA034
C6,C10	Jameco DM15/470
C7,C9	Jameco DM15/221
C12	Jameco DM15/331
Q1,Q2	Jameco
Y1,Y2	Jan Crystals
	Crystal Sockets
	Jan Crystals CE25
K1	Radio Shack 275-241
L1	Radio Shack 273-102
	Heat sink for 2N3053
	Mouser 33HS261

Table 5.

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12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-SA** is available for $196.95.

Bearcat® 145XL-SA

List price $189.95/CE price $98.95/SPECIAL
10-Band, 16 Channel • No-crystal scanner Priority control • Weather search • AC/DC
Bands: 29-54, 136-174, 406-512 MHz.
The *Bearcat* 145XL is a 16 channel, programmable scanner covering ten frequency bands. The unit features a built-in delay function that adds a three second delay on all channels to prevent missed transmissions. A mobile version called the **BC560XLT-SA** featuring priority, weather search, channel lockout and more is available for $98.95. CEI's package price includes mobile mounting bracket and mobile power cord.

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CIRCLE 121 ON READER SERVICE CARD

73 Review *by Bryan Hastings NS1B (ex-KA1HY)*

Nye Viking RFM-003 RF Power Monitor

Wm. M. Nye Co., Inc.
1614 130th Ave. NE
Bellevue WA 98005
Price Class: $297, with coupler and charger

Nye calls their new product a "power monitor" because of the variety of ways it looks at RF en route from the rig to the antenna (or back). This simple unit—the RFM-003 sports only five controls—is one of the more versatile RF monitoring devices on the market. In addition to SWR, forward, and reverse power measurements, it measures average power, holds peak power measurements for a user-selectable period, and automatically switches power ranges. Its highlight feature is the Amplifier Lock-Out (ALO) circuit, which unkeys a linear amp when it senses too much back RF.

Physical Features

The Power Monitor package comes in two parts—the dual-meter control box and the RF coupler. The coupler goes in-line between the transceiver (or linear) and the antenna (or tuner). (See photo). This 3" x 2-½" x 2" gray metal box has two opposing SO-238 connectors and a supple four-conductor cable about six feet long that connects to a plug on the rear panel of the control box. This coupler is directional, and the RF input and output connections are clearly marked. There are no stiff coax cable connections to hamper meter box positioning around the operating console!

The dark gray control box measures 8" x 4" x 3." Attached to it is a wide mounting swivel bracket, rotatable 360° around the width of the unit. This allows the op to mount the meter either from above, as in the case of the lower part of a car's console or lower dash, or from below, as under a ham shack table. It can also be removed, allowing the unit to stand on its own (rubber) feet.

The Front Panel

The SWR upper front panel has two meters side by side labelled SWR and RF WATTS. On the lower front panel, from left to right, is a Hold-Time variable control, six LEDs, and a three-position switch for PEAK POWER, PEAK POWER AND HOLD, and AVERAGE POWER. The Hold-Time control works when the switch is set for PEAK AND HOLD—it "freezes" the RF WATTS needle at its maximum deflection for up to 20 seconds, for easy reading.

Photo A. The front panel of the RFM-003 and RF coupler.

Photo B. Back panel of the RFM-003 and RF coupler.

The LEDs are arranged in three pairs. The first pair gives the status of the ALO circuit (discussed later). The middle pair deals with peak power measurement—one of them lights when the Monitor samples the RF, and the other lights when the RF WATTS needle holds at a maximum deflection.

The right-most LEDs are low and high RF scale indicators. On the RFM-003, the RF WATTS scale shows 0–300 W. This, however, *automatically* reverts to a times-ten scale (0–3000 W) when the unit senses RF power beyond 300 Watts, and the red LED lights to indicate that state.

A note on the brother model to the RFM-003, the RFM-005. The only difference between the two models is the power scales—the RF WATTS dual meters shows up to 500 and 5000 Watts, respectively, on the RFM-005. A ham has to obtain the specific RF coupler for this.

Back Panel

The two two-position slide switches allow for measuring either forward or reverse power and setting the kind of ALO trip the user wants (again, more on this later). Below them are the two RCA phono jacks to put the ALO circuit in line.

Straying over to the right side of the panel, the user finds two plugs—for 12 VDC external power source and Coupler attachment. Finally, next to the Coupler input is ALO SENSE, a recessed pot.

Powering the Monitor

The essential functions of the Monitor—needle deflection, LED lighting, and circuit powering itself—can run off a pack of four NiCds secured to the inside back panel of the meter box. The coupler shunts RF energy to the meter box to keep these batteries fully charged. The only function dependent on 12 VDC external power is the meter back-lighting. External power can also charge the NiCds.

Be Kind To Your Finals

Perhaps the most interesting feature on the RFM-003 is the ALO (Amplifier Lock-out) circuit. The user can set a limit—either SWR or reverse power—by first setting the rear panel switch to either SWR or REV and then adjusting the ALO Sense with a tweaker. The beauty of REV-mode ALO is that, once one knows the maximum tolerable reflected power to the

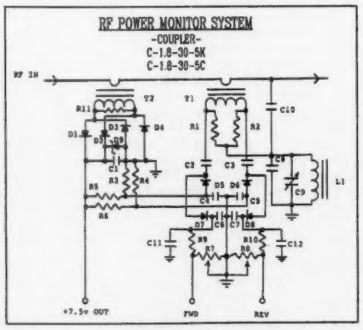

Figure 1. Schematic of the RFM-003 meter box circuit. R10 is located in the upper left section of the diagram.

Specifications

Accuracy	±5% of full scale
SWR Threshold	5W for the 5000 W RF coupler
Sample Time	For Peak and Hold, 1ms typical, 3ms maximum.
Hold-Time	.5 to 20 seconds typical
ALO SWR Adjustment Range	Approx. 1.6:1–7:1, factory set at 2:1
ALO Rev. Adjustment Range	For (K) couplers, 40–400 watts, factory setting 100 watts. For (C) couplers, 4–40 watts, factory setting 10 watts.
ALO Relay Contact Ratings	5 amps 120 VAC/28 VDC.
Power Consumption	Maximum operating450 mW Typical Operating 64 mW
Size	H 5" x W 8½ x D 5¼ max. values with swivel bracket fully extended.
Weight	4 lbs. Shipping 5 lbs.

tubes, it's not necessary to go through algebraic gymnastics (see sidebar) to figure the maximum forward power for every new SWR. Just set the ALO sense at that reverse power level and leave it!

When the chosen value exceeds the limit, the ALO relay opens whatever circuit it's in line with—usually the keying relay line between driver and amp.

Opening the relay line, however, sometimes doesn't do the trick. Many QSK amps running in QSK mode don't pay any attention to the driver-amp relay line. They keep chugging along only until they stop sensing RF at their input. For this case, Nye suggests putting the ALO circuit in series with the PTT line.

Specs. vs. Observations

I was able to compare a few of the specifications listed in the manual (see sidebar). The driver was the IC-761, which outputs a minimum of five watts—still enough to activate the SWR circuit. Hold-Time did indeed, have a maximum of 20 seconds.

For the ALO reverse adjustment range, however, the minimum setting was 50–55 Watts. This is still in line, since most linear amp finals can handle this minimum level of back power continuously. Those who find the range too high, however, can easily rectify it by replacing a resistor on the meter box PC board with one of a lower value. Contact Nye for more details on this modification.

Performance

I have been using the Monitor at my home station for the past few months with no troubles. It ran the gauntlet during the *73 Magazine* St. Pierre and Miquelon (FP/) DXpedition on Memorial Day weekend. Wayne W2NSD, Larry NA5E, and myself operated three 100-watt stations from a hotel room, feeding three antennas on the same hotel roof. There I found that when the other ops transmitted, the ALO sense LEDs and the SWR meter flickered and deflected madly. This occurred when we experienced only low-level (S-2) mutual QRM while operating on different bands on our rigs (one IC-761 and two IC-735s).

When we returned from St. Pierre, I called the Nye plant and spoke with Chris Mason, one of the developers of the power meter, about this problem. He explained that this was a result of the type of detection circuit in the RF coupler, and that roughly 1% of those who bought the monitor lived close enough to broadcast stations to experience the same trouble. The meter is simply so sensitive that it is triggered by sufficiently strong incoming RF! The meter, of course, doesn't see any difference between this and reflected power.

Chris suggests that those who live near FM broadcast stations install a low-pass filter in their antenna system. Offending AM broadcasts, however, require replacing R11, a 1kΩ (see RF Coupler schematic, Figure 1) to a lower value, such as 220Ω or even 100Ω. This does reduce power meter accuracy at low power, though not dramatically—it is within 5% at 20 watts out.

THE VIRTUE OF REV-MODE ALO

The ability to set a reverse power limit is an excellent idea. This allows the op to safely operate under varying SWR conditions. The next few paragraphs explain why.

Many linear amp manuals give reverse power tolerances only in terms of SWR. Bear in mind, however, that SWR is only a *ratio* of forward power to reverse power. For a given SWR, the lower the forward power, the lower the reverse power. The amp finals, however, don't care a whit about forward power in itself (except when they're forced to generate too much of it). They care only about the value of the reverse power, regardless of the SWR/forward power combination from which it results. In other words, higher SWRs than those stated in the manual are OK, provided the amp is run at sufficiently low forward power.

So what explains the seeming inconclusiveness of the SWR tolerance figure? The authors of the linear amp manual evidently assume the amp user will spend most of his time running the *full legal limit*, and they figure the SWR tolerance based on that. A ham doesn't have to run his amp at full bore, however, and is even encouraged not to do this unnecessarily. Lower-than-maximum forward power levels allow higher-than-manual spec. SWRs.

Let's look, for example, at the linear used for the accompanying review, the Barker & Williamson PT-2500A. The manual states that the operator must not run it over 2:1 SWR. (Earlier 2500 manuals state 1.5:1 SWR.) Assuming this was figured at 1000 W of forward power (which a call to Elmer W3FVT at Barker & Williamson confirmed), I calculated the maximum allowable reverse power in the following five steps:

1) $SWR = \frac{1+x}{1-x}$, where $x = \frac{\text{reflected power}}{\text{forward power}}$

Plug in the above SWR value and solve for x through cross multiplications:

2) $2 = \frac{1+x}{1-x}$, $2 - 2x = 1 + x$, $1 = 3x$, $x = .33$

For 2:1 SWR, then, the square root of forward over reflected power will always equal .33. Squaring both sides gives:

3) $.33^2 = \frac{(\text{refl. pwr.})^2}{(\text{for. pwr.})^2}$, $.11 = \frac{\text{refl. pwr.}}{\text{for. pwr.}}$,

4) forward power (.11) = reverse power

Formula 4) figures the reverse power for a given forward power when the SWR is 2. Plugging in the maximum forward power allowed, 1000 Watts, gives:

5) (1000 W)(.11) = 110 Watts

This is the maximum safe continuous returned power the B & W PT-2500A finals can accept.

Knowing this figure, it's possible to calculate the maximum allowable SWR for any forward power level, and vice versa. Say a ham can't tune his antenna lower than 2.5:1 SWR at the frequency he wants to use. Figure x for SWR = 2.5, as done in 2)

6) $2.5 = \frac{1+x}{1-x}$, $2.5 - 2.5x = 1 + x$, $1.5 = 3.5x$, $x = .43$

By the methods used in 3) and 4):

7) forward power (.18) = reverse power,

8) $\text{forward power} = \frac{\text{reverse power}}{.18}$

Plugging in the maximum allowable reflected power of 110 Watts gives a maximum forward power of:

9) $\text{forward power} = \frac{110}{.18} = 611$ Watts

Considerably more power than most barefoot rigs! This output is certainly worth keeping the amp in line.

The beauty of being able to set a reverse RF limit to unkey the amplifier is not having to refigure the maximum forward power for each new SWR. Even if the linear amp manual gives the tolerance only in terms of SWR, just go through steps 1)–5) once, to determine the maximum back power the tubes can handle. Then set the calculated ALO limit and crank the drive to the amp until that limit is reached. Trim back the drive slightly, and it's set!

Conclusions

The RFM-003 commends itself in all areas. The only concern potential buyers of this unit should have is their RF environment. If they live particularly close to AM broadcast stations, they have to be prepared to do the above modification and lose some meter accuracy. The unmodified unit is so accurate, however, that users shouldn't despair over not being able to get their match completely flat. Even though their previous meter may have shown 1:1 on the same system, the RFM is just showing more the reality of the situation. 73

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CIRCLE 353 ON READER SERVICE CARD

PATENTS ARE UNIQUE

Protecting Your Brainchild

by W. Max Adams W5PFG

Briefly speaking, in Federal (English?) language, "The United States of America to all whom these presents shall come: whereas, there has been presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful invention..."

Such are the first words on the red-seal, blue-ribbon, riveted front cover page of my patents, numbers 3657603 and 3814950. This article is not a legal advisory on how to obtain patents, rather it is intended to help you get on the right track when your brainchild is *unique* and you want to obtain a US patent.

Later, the first page continues:
"WHEREAS, upon due examination made, the said claimant(s) is (are) adjudged to be entitled to a patent under the law."

Patents are unique in many ways. A US patent, by law, dictates that it contains a "new and useful" invention belonging to "said claimant(s)." This means that your patent claims were successfully defended and are protected *by law* from others who may later try to claim, use or sell your invention. The Patent Office may also issue patents to anyone making improvements to previously patented inventions, irrespective of the holder of the original patent.

Patents are granted for a term of 17 years (14 years for design patents) and may be extended only by a special act of Congress. After a patent expires, "the patentee loses rights to the invention."

The patenting process is long, tedious, and to some degree expensive. Subsequently, many unique ideas are simply passed along and never recognized under the law.

Creative Minds, Capable Hands

Patents are the result of a creative mind linked to capable hands. One facet of amateur radio is the solder-burning, mechanically-constructive, home-brew ideas of creative individuals. Many are asked, "Why don't you get it patented?" Often they reply, "I think I will!"

Silently, you ask yourself, "How do I get a patent?" You answer, "I don't know, better see me a lawyer fella, maybe. Just maybe he'll shed some light on the procedure." The US Patent and Trademark Office maintains a register of attorneys and agents who have met the legal, scientific, and technical requirements, and who have agreed to uphold a standard of professional conduct.

I was lucky. An acquaintance at work had just received his patent.

"Why not give my patent attorney in Washington a call? He will be glad to help you. That's his business. He is just across the street from the patent office and can save you some leg work."

Dealing With The Law

Your patent attorney will only tell you your idea "has possibilities!" He will initiate a patent search, with advance payment of his fee, and advise you of his findings, then describe the next steps, and the advance payment for performing the next step.

Recently, I followed my previous footsteps, and called the same number I used in 1971. Naturally, I was not remembered. However, when I referenced my two patent numbers, my lawyer fella found something in his files and referred me to Mr. Oscar Mastin (703-557-3341) at the US Department of Commerce, US Patent and Trademark Office, Office of Public Information, Washington DC 20231. (Direct your questions to: 703-557-4636). Mr. Mastin was very polite. Within 5 days I received a free copy of *Basic Facts About Patents*, which details what patents are, who may obtain them, and many more useful details to help inventors. The booklet answers most of the fundamental questions about patents. What is a patent? "A grant of a property right by the Government to the inventor..."

What types of patents are there? "The patent laws provides for the granting of patents in three major categories; Utility Patents, Design Patents and Plant Patents (...any new and distinct variety of plant, including cultivated...)"

Who may obtain a patent? "Patents are granted only to the true inventor."

When can you obtain a patent? "A valid patent may not be obtained if the invention was in public use or on sale in this country for more than one year prior to the filing of your patent application. Your own use and sale of the invention for more than a year before your application is filed will bar your right to a patent just as effectively as though this use and sale had been done by someone else."

What about ownership and sale of patent rights? "The inventor may sell all or part of his interest in the patent application or patent to anyone by a properly worded assignment."

Is your invention protected in foreign countries? "The United States patent protects your invention only in this country."

How can you obtain copies of previous patents? "Printed copies of any patent, identified by its patent number, may be purchased from the Patent and Trademark Office at a cost of $1.50 each. NOTE: Prices subject to change."

What does "patent pending" mean? "The terms 'patent pending' and 'patent applied for' are used by a manufacturer or seller of an article to inform the public that an application for patent on that article is on file. The law imposes a fine on those who use these terms falsely."

Will the Patent Office offer legal help? "The Patent and Trademark Office cannot assist in preparation of application papers, and strongly advises prospective applicants to engage the services of a patent attorney...The Office will answer an applicant's inquiries about the status of any application, but if you have an attorney or agent, correspondence should be forwarded through them."

What about promoting and marketing your inventions? "The Office cannot assist in development and marketing of an invention...Office has no control over...patent promotion organizations. It is advisable to check..."

Basic Facts About Patents also includes information about patent application, disclosure document program, patent searches, and patent fees. Incidentally, the basic filing fee is $340 and later, the issue fee is $560. "These amounts are reduced by 50% when the applicant is a small entity..."

Alternatives

An "electronic" patent, obtained by a private individual (without any assignment), is a very difficult but ego-satisfying achievement. If you have a unique idea, you may want to encapsulate it in plastic, flood the market, then get to work on another brainchild. Next best, file for a patent, and when it becomes eligible for "Patent Pending," keep it that way (if you can afford to do so). Or obtain a copy of a previously issued patent for $1.50 that becomes available to the world, as I did. An office full of corporate lawyers and engineers can then blow it full of holes, improve it, simplify it, and leave you with a nice document suitable for framing!

In '72, about one year and $2000 later (including patent office fees), I finished reading the cover page,
"In testimony whereof, I have hereunto set my hand and caused the seal of the patent office to be affixed at the City of Washington this eighteenth day of April, in the year of our Lord one thousand nine hundred and seventy-two, and the Independence of the United States of America the one hundred and ninety-sixth."

At least I can point to the two frames on the wall and proudly say, "Yes sir, at least mine was the FIRST!"

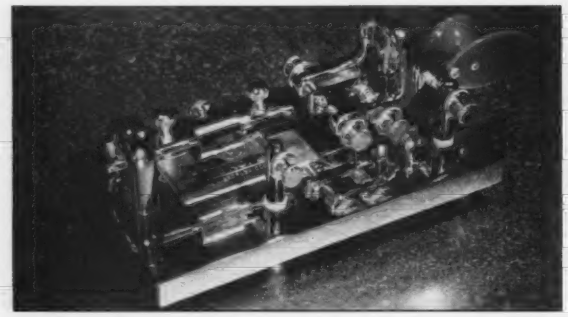
Do not be discouraged by all the legal terms, paperwork, and patience required. If you have a special idea, burn some solder, and go for it! 73

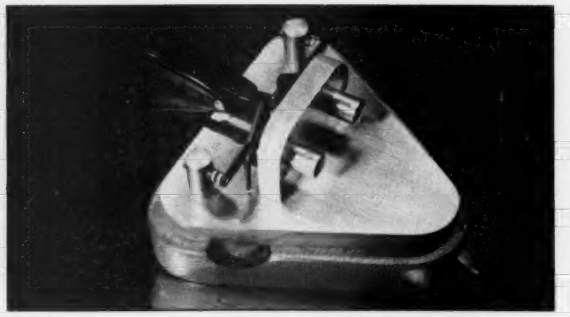
73 Review *by Larry Ledlow, Jr. NA5E*

Beauty and the Best

Something old, something new from Vibroplex

Vibroplex
98 Elm Street
Portland, ME 04101
Price Class: Original Deluxe: $85
Brass Racer EK-1: $115





What's this? A few months ago I wrote an editorial espousing a no-code ham license. So what am I doing reviewing keyers? Truth is, I *like* CW. I've always had a sort of affair with this much-maligned mode. And these two offerings from Vibroplex have made my affair so much the sweeter. A CW craftsman with proper and elegant tools from Vibroplex can make beautiful music over the airwaves.

Vibroplex has offered quality "tools" for code craftsmen for almost 100 years. Anyone who has tried to send more than 15 words per minute with a straight key knows the limitations of their fist. Before Curtis brought modern, electronic iambic keying to telegraphers, the Vibroplex "bug" was a standard to which all other high-speed sending keys were compared.

Comparing the Vibroplex Original key and their Brass Racer is a bit like comparing a harpsichord and a modern music synthesizer. They both render sweet tones in the right hands, but the skills needed to manipulate them are different. They probably appeal to different types of people. One thing is certain, though: they both represent some of the finest code keys available today.

The marvelously mechanical Original bug first attracted my attention as an object of historical interest. I carefully unpacked my new bug (serial number 54815) only to be overwhelmed by its sheer beauty and intricate mechanical design. The deluxe model's chrome plating and bright red paddle make it a real standout in today's charcoal gray and black ham shack. After some study, I began to appreciate its mechanical operation: springs, levers, and a vibrating mass. Boy, could I have had some fun with a bug in one of my college physics classes!

Bug operation requires somewhat different skills than those developed with most electronic keyers. Pressing the paddle to the right causes the pendulum to vibrate and to touch the dot contact nearest the adjustable mass. After the required number of dits are completed, the operator releases the paddle, and the pendulum oscillations are damped out. Dit speed increases with the mass moved inwards. Easy, huh? The tricky part comes in making dashes.

Users of iambic keyers are used to having the machine make proper length dashes, or dahs. Not so here. The sender must manually close the dash contact for the proper duration. Many programmable electronic keyers offer this semi-automatic operation mode. *Minimum* speed with a bug is about 15 words per minute.

Remember Elmer's advice to use wrist and fingers, not arm motions to send clean CW? Forget all that with a bug. Bug operation requires free arm movement for proper operation. Do not grasp the paddle, either. The bug should be operated with thumb and two fingertips spaced wider than the paddle and free, easy arm movements back and forth. Now that's different.

No electronics and just a few electrical contacts to keep clean make the Original bug suitable for any environment. Further, a bug in the right hands not only looks good; it *sounds* great.

As good as the Original bug is, many CW operators will prefer the Vibroplex Brass Racer. The Racer is an attractive key with a triangular, heavy brushed brass foundation mounted atop a walnut base. Model EK-1 includes a Curtis 8044 IC-based electronic keyer built into its base. The Racer's gold tone and black paddles would look good in any shack.

The EK-1 Racer can be used with any positively or negatively keyed transceiver. (Most tube-type rigs use positive keying.) The data sheet that comes with the keyer gives very clear instructions on proper wiring. Aside from a ¼-inch phono plug, the EK-1 comes with a 7.5V battery (Duracell T-175 equivalent) to power the keyer for a year or more and a hex key to adjust paddle tension and spacing.

The Racer had a number of surprises, not the least of which is the way paddle tension is adjusted. Two brass holders located on the back side of the paddle mount contain tiny magnets, which attract steel crossbars on the paddles. By increasing or decreasing the distance between the magnets and the crossbars, tension decreases or increases accordingly. I like this feature a lot. It sure beats complicated spring and screw adjustments found elsewhere.

After reading the keyer instructions, I removed the two retaining screws on the base bottom to expose the EK-1's keyer circuit. The PC board is well laid out and provides easy access to all components, including a socketed IC, should the need arise to repair the keyer. Surprisingly, the battery holder does not have any clear polarity markings, and the instructions stress the importance of observing proper battery polarity. Gee, I wonder how many keyers have smoked because users didn't read the instructions or didn't have them available for reference. Even though a + could easily be added with a marking pen, I don't think buyers should have to worry about things like that, especially considering the EK-1's price.

The last surprise was the speed (5–50 wpm) adjustment pot, which is slightly recessed on the right side of the base. Considering the fine overall finish of the Racer, to find a bare 500kΩ plastic potentiometer here is a disappointment. The pot on my Racer is very stiff and difficult to adjust. I would certainly expect a slightly larger knob with smoother action on a keyer in this class.

Nonetheless, Vibroplex is still the first name in code. Anyone half serious about CW should have at least one of these beauties in their arsenal. They are, after all, simply the best!

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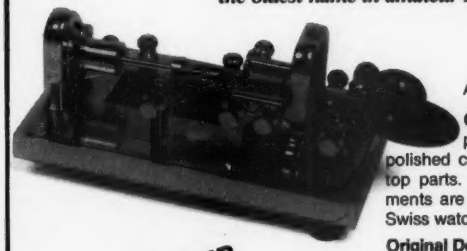

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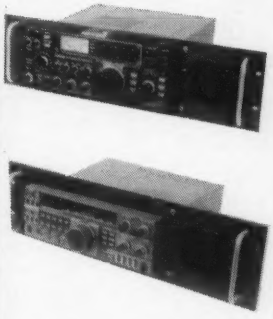
CIRCLE 361 ON READER SERVICE CARD

THE RACK IS BACK

GO VERTICAL



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Price Class $170

73 Review *by Larry R. Antonuk WB9RRT*

Ramsey CT-90 Review

Only a few years ago, the frequency counter was a relatively exotic instrument. Due to their high cost, counters were found only in broadcast stations, communications shops, and the like. Some fortunate hams actually had access to these hundred-pound marvels—as long as they sneaked into the shop after hours.

Times have changed. Through the miracle of VLSIC semiconductors, manufacturers are now able to produce very small, highly accurate, and easy to use test instruments at prices that are hard to believe.

The Ramsey Electronics CT-90 is just such an instrument. Priced at $169.95, the CT-90 provides all of the features of the old beige dinosaurs, and then some. The unit measures frequency from 20 Hz to 600 MHz in three overlapping ranges. Gate times of 0.1, 1.0 and 10.0 seconds are available.

The 9-digit, 0.4-inch display has lead-zero blanking and automatic decimal point placement. The CT-90 comes with a temperature-compensated 1.0 ppm time base, with a 0.1 ppm time base optional. A HOLD button is provided which lets the operator freeze the display for reference. All of these features are packed into a 5.0 x 5.0 x 1.5 inch box and powered by an internal NiCd battery—giving us a total weight of one pound!

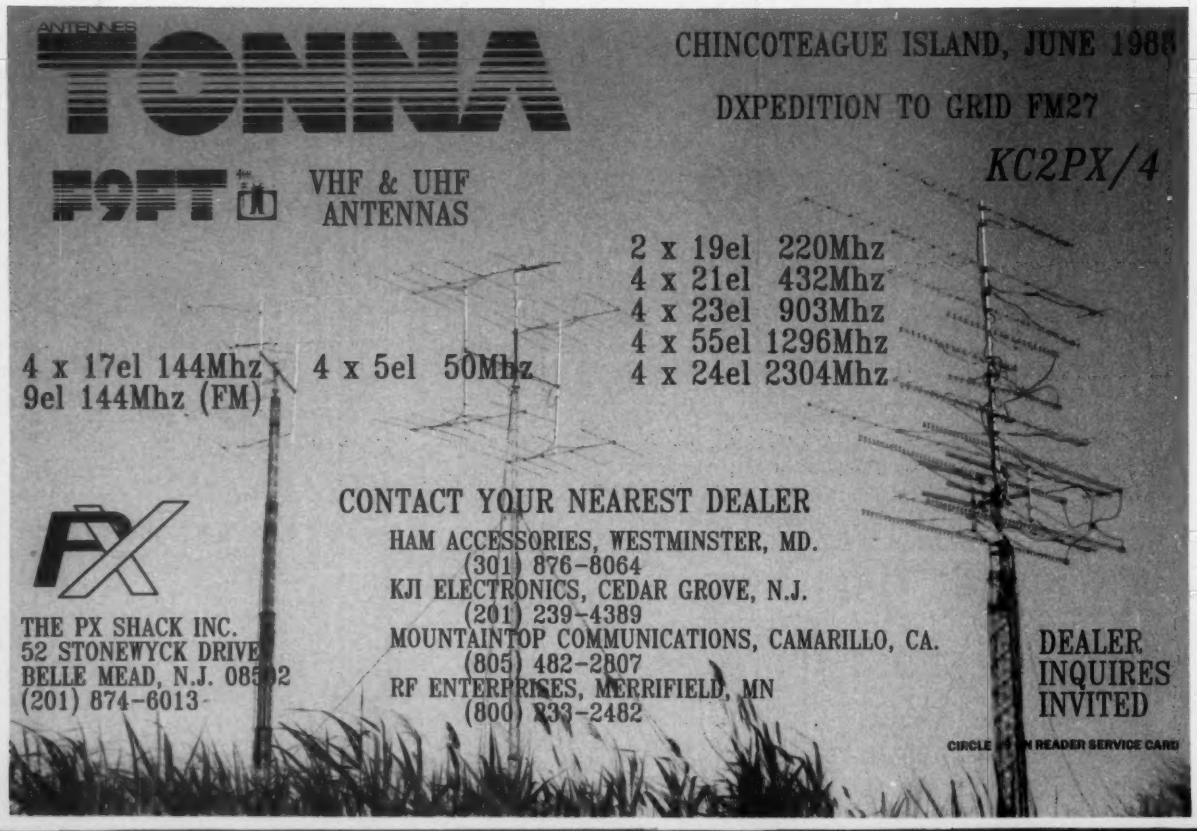
The CT-90 Portable Frequency Counter

Using the CT-90 is simplicity itself. The desired input range (10 MHz, 60 MHz, or 600 MHz) is selected by a front panel switch. Two counter inputs are found on the back of the instrument. One BNC connector is for the 10 and 60 MHz ranges, the other is for the 600 MHz range. Should the user need assistance, the manual gives explicit instructions—even to the point of giving directions for building probes, coupling boxes, and sniffer loops. The collapsible antenna (included) mounts directly to the input connectors. Off-the-air monitoring is adequate for many applications.

The greatest feature of the CT-90 is the NiCd battery pack. The convenience of being able to pick up a frequency counter, unplug it, and carry it around the shop while making measurements cannot be emphasized enough. (Try doing that with that big beige box!)

The CT-90 Portable Frequency Counter is a useful tool in its own right, whether used for adjusting emergency AC generators, setting transmitters on frequency, or for general troubleshooting. The unit will also enhance the value of other test equipment. For instance, using the CT-90 in conjunction with a used or inexpensive signal generator will yield a highly accurate source of RF for receiver repairs.

At only $169.95, the CT-90 is the ham radio troubleshooter's next logical acquisition after the DVM.



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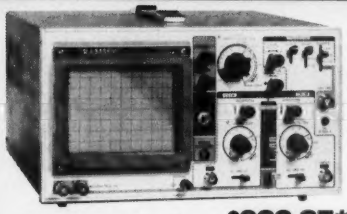

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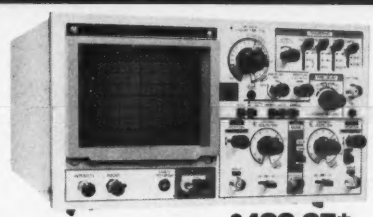

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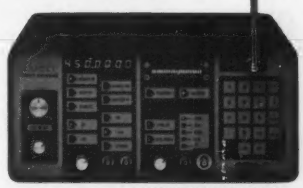

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3500	35 MHz	(2)	8x10CM	1 mV per div	50 MHz	60 MHz

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*Add an additional $10.00 for each unit for shipping.

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$139.95 WIRED, INCLUDES AC ADAPTER

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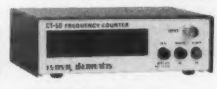
$169.95 WIRED INCLUDES AC ADAPTER

CT-50 8 DIGIT 600 MHz



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CT-125 9 DIGIT 1.2 GHz

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MODEL	FREQ RANGE	SENSITIVITY	ACCURACY	DIGITS	RESOLUTION	PRICE
MINI-100	1-500 MHz	Less than 250mv	1 PPM	7	100 Hz, 1 KHz	119.95
CT-70	20 Hz-550 MHz	< 50mv To 150 MHz	1 PPM	7	1Hz, 10Hz, 100Hz	139.95
CT-90	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	169.95
CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	< 25mv @ 50 MHz < 15mv @ 500 MHz < 100 mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OV-1 OPTION	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.90

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MAD BLASTER
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MB-1 Kit **$4.95**

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Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

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An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.

WL-1 Kit **$6.95**

FM WIRELESS MIKE
Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 Kit **$3.95**

FM-2 Kit **$4.95**

SIREN
Produces upward and downward wail. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.

Complete kit, SM-3 **$2.95**

SUPER SLEUTH
A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker.

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CIRCLE 34 ON READER SERVICE CARD

CHOOSING A QSL CARD

Which Style and Design Reflects You Best?

by Jennifer Roe WA6OHX

One day I said to myself, "Well, it's time again for me to decide which QSL card to buy. Of course, I'd like to design the *ultimate* card which really tells the recipient all about me in just one glance—but no, I think I'd rather have a photo of me at my station. Or maybe a color picture of the green hills of Simi Valley. Gosh, what am I going to do? Possibly this time I'll pick a standard design. Oh, for heaven's sake! There are only 1001 plus "standard designs" to choose from. Now I'm in trouble! Decisions, decisions, decisions. You'd think I was making an investment in a home."

I was determined to tackle this project logically. I picked up *73*, *QST*, *World Radio*, and *CQ*, and listed all the QSL card vendors I could find. I dropped a bunch of letters in the mail requesting samples. Most of the samples arrived in the return mail (two to five days, depending on location). The responses were excellent. I laid the samples out on the floor and examined each packet carefully.

Compiling a Shopper's Comparison Table

The shopper's comparison table which appears was compiled on one contact only. I wrote and requested the samples and based all of the information on the literature and samples I received. It was a challenge to place the information in specific categories. Especially difficult were the terms "standard" and "custom" cards. Some standard cards are completely inflexible, while others have an inflexible design but choices on any or all of the following: paper (color or weight), ink color, report format, and font. Other cards are "standard" in report format and location of design and information, but there is a choice in the actual design. Oh, help! Design tastes are very individual, so I decided not to

KEY FOR TABLES

(1) I suggest that you send $.39 in stamps to help defray the vendors cost of mailing free samples. It is not requested by the vendor.
(2) The amount is applied to cost of QSL (therefore it is refundable with purchase). In some cases there is an expiration date.
(3) Shipping and handling included in price. (I assume this means USA delivery only.)
(4) 3 colors (orange, blue and white).
(5) Refundable on order over $20.
(6) Minimum order $14.
(7) ARRL logo at no extra charge.
(8) Logos included free.
(9) Extra charge.
(10) Displayed on sample. No mention in the literature.
(11) Accepts C.O.D. orders.
(12) Vendor supplies cuts, logo, font, different stock which makes the "standard card" a design-your own.
(13) Standard card or sample with a few choices such as font styles, card colors, ink color, stock, etc.
(14) Grab Bag QSL

cus = custom
std = standard
wks = weeks
hrs = hours
? = unsure
b/w = black and white

QSL COMPARISON TABLE

	Brownies' QSLs	Chester QSL Cards	Colorful QSLs	Connor	Constantine	Ebbert Graphics	Gazebo Press	Holiday Graphics
Samples	$1.00(2)	(1)	1.00(2)	(1)	$1.00(2)	.50	.50	SASE
Standard	no.(13)	26	5(13)	10(13)	yes(13)	18(13)	yes(13)	yes
Custom Printing	yes	yes	no(?)	yes	no	yes	yes	yes
Custom Artwork	yes	yes	no	no	no	no	no	yes
Photos	no	b/w,color	no	no	no	no	no	no
Other Services	no	no	no	no	no	stamp	no	masters badges, cards
Stock	gloss, semi-gloss, pearl, woodgrain (12pt)	12pt cards gloss	12pt king james glossy	90# scott index (&10pt gloss)	(10pt)	(10pt)	semi-gloss high-gloss (10pt)	–
Paper Color	5	yes	white	white	yes	white	white	–
Ink Color	11	16	4+ rainbow	4	black	4	variety	–
Standard Postcard	–	–	–	–	–	–	–	–
Logos	ARRL(7)	yes(8)	yes(9)	ARRL(7)	no	yes(9)	ARRL	yes(8)
Pricing	$14/100 (3)	$33.50/200	$59.63/250	$9.85/400	$8.00/100 (3)	$19/100	$9.97/100	$12/100
Minimum quantity	100	200 std custom	250	100 gloss 400 matt	100	100	100	100
Delivery	first-in first-out	4–5 wks cus 7–10 day standard	–	–	48 hrs variety, 2 wks single	4–6 wks	–	–
Visa/Mastercard	no	yes	no	no	no	no	no	no
Ease of Ordering	2	3+	2+	2	1	2	2–	2–
Type (Font) Styles	–	yes	yes	no	no	yes	no	yes
Written Guarantee	money back	limited	–	–	–	limited	–	–
Printing Evaluation	7	7	8	5	3	6	6	–

judge anything in that area. What I find pleasing might not appeal to others.

The following categories comprise the shopper's comparison table:

Samples: To receive samples, many vendors request the customer to send stamps, money or SASE (self-addressed stamped envelope). I recommend that even if there is no request, include 39 cents in stamps to help defray the vendor's mailing costs.

Standard: Does the vendor have a standard card? I define a standard card as a basically inflexible design. Only personal information (including logos, awards, and affiliations) is changeable. If there were standard cards in the vendor packet, I listed the quantity. If there were flexibilities, such as card or ink color, or font styles, I noted this (13). In some cases no standard cards are offered. However, in my opinion, the samples can be ordered and serve as the standard card.

Custom Printing: Does the vendor print cards from the customer's original *camera-ready* artwork? (yes/no) Camera-ready is exactly that, the master artwork from which the printer makes the negative for printing. If two-color printing is desired, there are two masters. Anything else is considered a sketch!

Custom Artwork: Can the vendor create original artwork from the customer's sketches (ideas), or can the vendor design a card from their own designs—or a combination of the two? (yes/no)

Photos: Does the vendor offer photo card printing? Photo cards can be printed in black and white (b/w) or color. Costs of black and white cards vary between $37.50 and $77.60 per 1000. Color cards vary between $189.50 and $316.37 per 1000. Read the vendor's suggestions on how to choose a photo.

Other Services: Does the vendor offer services and products in addition to QSL card printing? Examples of other services are envelope printing (env), eyeball QSL cards (cards), and rubber stamps (stamp). "Variety" refers to a number of services or products.

Stock: The paper stock available for printing the QSL cards. This can be very confusing because the standards are changing. The thickness value may be given in points (12pt is heavy, 8pt is lightweight), or in pounds (110# is heavier than 90#). The information in parenthesis () has been supplied by a local printer, not the vendor.

Paper Color: The number of colors available. White is counted as a color. If colors are evident in either samples or in the literature, but not specifically listed, "yes" appears in the table.

Ink Color: The number of colors available. Black is counted as a color. If colors are evident in either the samples or in the literature, but not specifically listed, "yes" appears in the table.

Standard Postcard: Does the card meet the new US Postal Service regulations for a postcard? (yes/-) "Yes" means that the vendor has specified that their cards meet this requirement. If not stated in the literature, a dash (-) appears in the table. This is not to infer that the vendor's cards cannot be mailed as a postcard. If you are concerned about this, check with the vendor.

Logos: Does the vendor offer a logos? ARRL, other logos and emblems, and awards may be offered by the vendor. Where I found a reference only to the ARRL logo, ARRL appears in the table. "Yes" means the ARRL logo and more. Costs for logos vary. In some instances the ARRL logo is free. When I could not find any logos mentioned or see one on the sample, "no" appears in the table. This is not to imply that the vendor doesn't have any logos available. I just didn't see any. Check this one out carefully.

Pricing: The lowest price quoted in the literature. Where there is a choice, such as $9.75 for 100 or $15 for 300, I reported the minimum amount of $9.75, not the best deal (100 for $5 with a minimum purchase of 300). The cost of shipping and handling is not included in the minimum cost unless noted with (3). Shipping costs vary with the distance of the vendor to the customer.

Minimum Quantity: This is the minimum quantity which can be ordered. It may vary by design, paper stock, or custom requirement.

Delivery: This is the delivery time quoted on the literature (assuming delivery in the USA). A few vendors do not quote a delivery time. Others state that their delivery time can be sped up with a rush charge added to the price. The method of delivery generally is mail or UPS.

Method of Payment: Does the vendor accept Visa or Mastercard orders? (yes/no) If the table says "no" the only method of payment is check or money order. Never send cash. With the exception of Raum's, none of the vendors will accept C.O.D. orders.

Ease of Ordering: (1= poor, 2= average, 3= excellent) This is my judgment call. I based it on the clarity and presentation of ordering information, the existence of an order blank and return envelope, and the completeness of the order blank and/or price sheet.

Type (Font) Styles: Are there different

	KW Litho	Little Print Shop	Mac's Shack	Marv Mahre Mahre& Sons	The Olde Press	QSL's by W4MPY	Raum's
Samples	2 stamps	(1)	$1(2)	SASE	.50	(1)	$1(5)
Standard	no(13)	28	12	no(12)	6(13)	7(13)	26(13)
Custom Printing	yes	yes	yes	yes	yes	yes	yes
Custom Artwork	yes	no(?)	no	yes	no	yes	no
Photos	b/w,color	no	no	no	no	b/w	b/w
Other Services	no	no	no	cards	cards	cards	no
Stock	12pt glossy matt florsecent woodgrain lightweight	high gloss (8pt)	(8pt)	pearl florescent high gloss (10pt)	gloss matt (various)	vellum bristol or semi-gloss (110# & 10pt)	glossy (10pt)
Paper Color	yes	white	white&tri-color (4)	-	8	3	yes
Ink Color	any	3	black	variety	7	3	yes
Standard Postcard	-	yes	yes	yes	-	-	-
Logos	ARRL(7)	ARRL(7)	ARRL(7)	yes(8)	ARRL(10)	yes	yes(8)
Pricing	$34.73/ 200(3)	$20/ 100(3)	$8.95/100	$29/ 100(3)	$4.50/100	$17.95/ 500	$11.25/ 100(3)
Minimum quantity	200	100	100	100	100	500	100
Delivery	3–4 wks	10 working days	3 wks	10 working days	none	10–15 working days	4-6wks cus 3 wks std
Visa/Mastercard	no	no	no	no	no	yes	no(11)
Ease of Ordering	2	2–	2+	2–	2–	3	1
Type (Font) Styles	yes	no	no	yes	yes	yes	no
Written Guarantee	-	-	-	-	-	money back	-
Printing Evaluation	8+	6	6	6	4	5	7

styles of typeface (fonts)? (yes/no) This is for "customizing" standard cards or creating custom cards. "Yes" means that the literature mentions or shows samples of different font styles. I did not consider the card samples in this instance.

Written Guarantee: The vendor's literature may mention a specific guarantee. "Money Back" means that the customer must be satisfied or the cards will be reprinted or money will be refunded. "Limited" is limited to errors made by the vendor and may be restricted to reprinting the order. Not mentioning a guarantee does not suggest that the vendor won't assume liability for his errors. A reliable vendor (and I must assume that all these are) should guarantee against vendor errors, misspellings, and typos. However, incorrect information on merchandise due to customer error is *not* covered. I recommend that orders be typed or very carefully printed. Have another person proofread the order to verify that it is readable. Be especially careful of the letters OQDVUMGJ.

Printing Evaluation: (A 1-10 scale with 1 being bad, 5 average, and 10 superior) I am not a printer. Therefore I asked a professional printer (not in competition with the QSL card vendors) to help me judge just the printing jobs. The design and layout were not considered. The evaluation was based only on the overall difficulty level of the printing task and the execution of the task itself.

Decisions, Decisions, Decisions!

There are many decisions to make before contacting a vendor:

1 How many cards do you need?

a. How many do you send out each month? (Get a minimum of one year's supply.)

2. How much can you spend?

3. Purpose of card?

General usage (one card for everything).

Special occasion card (the "show" card).

DX card (Lightweight for minimum mailing costs. The county information should be on the card and spell out the state).

4. Standard card, custom card, or photo card?

Standard cards are generally cheapest. Photo cards tend to be the most expensive.

5. What weight of card stock do you want?

Lightweight cards are cheaper to send and less expensive to print, but the heavier weight cards are less fragile.

6. Glossy or matt finish?

7. Do you want the report on the face of the card or on the back?

8. What associations are going to be listed on the card (ARRL, other national organizations, clubs, or awards)?

9. Do you want the equipment printed on the card?

Keep it Simple

QSL cards are as individual as the hams sending them. A good rule of thumb is to keep it simple. The less busy the design, the more aesthetically pleasing to the eye.

Rather than wait for the ultimate original QSL design, I recommend that the first timer pick an inexpensive, lightweight, standard-design QSL card. It gets you going quickly with minimum expense, and later the cards can serve as backup cards or DX cards. Also, you can better evaluate your needs after usage.

Be aware of hidden expenses, such as custom designs, special paper, two- and three-color runs, and additional lines of text. Logos and shipping and handling costs can also boost the basic card price. Be alert. To save money, pick a standard design, standard paper, and one ink. Stay within the line allotment of the vendor and choose the logos you want displayed very carefully. Consider picking a vendor close to your location (less mailing costs). You might be able to save on state tax on an out-of-state vendor, but if they are too far away, the cost of shipping and handling may outweigh the tax savings.

Once you have decided precisely what you want, I suggest that you submit a letter to the vendor requesting them to quote a price and delivery date on that particular design. Include a sample card (if applicable) or the artwork (either a sketch or camera-ready), specifically noting the ink colors, font types, paper color and/or weight, report format, and the quantity. You can request a quote on various quantities (i.e., 100, 250, 500, 1000) to ascertain the best deal for your budget. This gives both you and the vendor an opportunity to review the order to be sure the price is agreeable. (Retain a copy of the letter for your records.) *Do not assume anything, ask questions!* If you choose a custom card or photo card, seek out the vendor's opinion on your design and/or photo. They can give you a clue as to whether your choice will achieve the results you desire. There's nothing worse than getting stuck with 1,000 QSL cards you're unhappy with.

Take a few minutes to ponder the above questions and check the comparison table for the QSL vendors that most suit your individual needs. Don't contact just one vendor, shop around.

Check other sources of QSL cards, such as the local club or ham radio store. In my area we have a local ham who prints the club card. A nearby store offers several "standard" QSLs. Get to know what's happening locally.

Which card did I choose? I'm not telling. If you want to know, catch me on the air sometime. Do you QSL??? 73

	Ray Evans K7HLR	Rusprint	Samcards	Sandollar Press	Shell Printing	Bud Smith (QSL Samples)	M.Smith VE7FI Hobby Print	WB4BPD QSL's (Gus Browning)
Samples	.50¢	SASE	.25¢	SASE	(1)	$1(2)	$1(2)	(1)
Standard	no(12)	10(13)	7(13)	6	5(13)	8(13)	8	no(13)(14)
Custom Printing	no	no	no	no	no	yes	yes	yes
Custom Artwork	no	no	no	no	no	yes	no	yes
Photos	no	no	no	no	no	no	no	b/w
Other Services	no	variety	env stamp	stamp	no	no	no	no
Stock	glossy crystallon calypeo (10pt)	glossy (10pt)	glossy matt (10pt)	semi-gloss (10pt)	vellum bristol (110#)	matt glossy (Various)	(various)	matt semi-gloss (110#)
Paper Color	4	standard with design	white	white	4	2	yes	by request
Ink Color	3	3	9	black	3	3	2	by request
Standard Postcard	–	–	–	–	–	–	–	–
Logos	yes(8)	ARRL(7)	yes(7)	–	ARRL(7)	yes(8)	–	yes(8)
Pricing	$25/ 100 (3)	$24.95/100	$15/ 100 (3)	$20.50/ 200 (3)	$8/100 (3)	$14/ 100 (3)	$30/ 250 (3)	$17.50/100
Minimum quantity	100	100	100	200	100	100	250	100
Delivery	Prompt	1–4wks	first-in first-out	3wks	2wks	2–3wks	2–3wks	3–4days
Visa/Mastercard	no	yes	no	no	yes(6)	no	no	no
Ease of Ordering	1+	3	2+	2+	3	2–	1	2–
Type (Font) Styles	yes	no	no	no	no	no	no	no
Written Guarantee	–	money back	–	–	–	–	–	–
Printing Evaluation	6	8	7	7	6+	5	4	4

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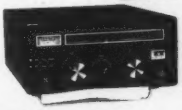

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THE "CREW AT 22"

Set to fight AIDS on the Air

by Joseph J. Fairclough WB2JKJ

Mike Miller N4JPG is not an AIDS sufferer, though he does have AIDS, but an AIDS fighter. Mike is a charter member of "The Classroom Net" which meets daily on 7.238 MHz at 7AM eastern standard time. Using the theme of ham radio, its purpose is to promote education and a better life for young people. Mike contracted the disease several years ago after receiving factor 8, which facilitates the clotting of blood, for mild hemophilia. At that time, unlike now, donated blood was not routinely checked for AIDS.

What is important to Mike is educating people about AIDS and dispelling the many myths surrounding it...enter WB2JKJ, the Crew at the radio club of Junior High School 22 on Manhattan's lower east side, and the Classroom Net.

For those unfamiliar with the Big Apple: the lower east side of Manhattan Island is a conglomeration of tiny streets, larger boulevards, teeming multi-story housing projects, and tenements left over from the turn of the century. Surrounded by areas of unreal wealth, Loisada or alphabet city, as it is called by its residents, is home to some of the poorest inhabitants of the city. It also has the second highest concentration of AIDS cases in the nation.

Junior High 22 is in the midst of all this, or as we like to say, "at the core of the Big Apple." At "the core," the Big Apple has its problems, but it also has its possibilities for a better life for the youngsters involved in ham radio in the classroom—with education through communication.

Our unique program at 22 is designed to promote learning among youngsters that have not been academically successful. However, one must survive to learn.

For years, kids going through the program have known Mike on the air, and have heard stories about his trips as a sea captain to far off places. Many have even spoken to him while he was at sea. They know that he supports the program with both friendship and finances, and that their friend now has this disease that everyone can talk about, but with different answers to the same urgent questions.

What to do? Get 30 or 35 kids together at a time, and have a real question and answer period on the air. That's right, smack on 7.238. The "Crew" know and trust Mike. They open up and get right answers to real questions, and at the same time educate those listening on their ham or shortwave radios. Let the kids ask anything and everything in their own language. We opened the session up to friends and community members not in the program, but brought in by the "Crew" for this special event. Ham radio is on the scene at the time of disaster, and truly, the alarming spread of AIDS through this one New York community is a disaster of monumental proportions.

It sounds like a great idea, a life saving idea, and a wonderful use of ham radio—but will it work? After the first 67 eighth and ninth graders had their first session with N4JPG in early March '88, we knew we had something. Every type of question you could imagine, from how, to why, to where, all in the language of the street, was skillfully handled by Captain Mike. The unanimous comment from the kids was "At last we got somebody that knows the real answers!" Those answers will keep coming.

Joe Fairclough WB2JKJ, originator of "Education thru Communication," and Mike Miller N4JPG are now planning for the Fall '88 term. We want to reach all 200 plus that learn via ham radio at 22, and also bring in the other schools around the country that work with our group. We want to go into Loisada and meet with kids younger and older than the "Crew" and introduce them to ham radio, then to N4JPG and the message he has to deliver. Ham radio has saved many lives over the years, and hopefully we can use it now to educate and save many more. 73

Photo A. Mike Miller N4JPG, operating from his shack in Oriental, North Carolina. He is fielding questions put to him about AIDS from the "Crew at 22."

Photo B. Kathy, sixteen and in the eighth grade, asks Mike a question about AIDS—something she "Always wanted to know but didn't know who to ask!"

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73 Review by Phil Nowak

The MFJ Gray Line DX Advantage

Are you a big gun DXer, or just a little pistol like me? With my barefoot rig and four-band vertical antenna in the backyard I need every available "advantage" to work *any* DX. How about you?

Did you stop by the MFJ booth this year at Dayton? They were demonstrating a new product for the DXer who owns an IBM PC or compatible. Unfortunately, I missed it at Dayton. Quite by chance, however, I met "Mr. MFJ," Martin F. Jue, at this year's consumer electronics show. This review is a result of that chance encounter.

Handy

The MFJ Gray Line DX Advantage is a handy little program for the IBM PC and its clones. When the program arrived in the mail, I couldn't wait to try it out. It's really easy to use. Turn on your computer, bring up your version of DOS, and select an open drive. (It's the A drive on my machine.) Insert the MFJ disk and type the command TERMINAT. That's enough to get you going. A map of the world appears on your screen. If you own a vintage PC like mine, it takes a few seconds. On a 386 machine it comes right up. The first thing you notice is the light and dark areas on the map. When daylight is longest in the midwest, the light area resembles a bell. During the short days in December, the dark area resembles a bell. Right now, during the summer, the line separating the light and dark areas resembles a sine wave. As the seasons change, so does the shape of the curve. Clever program.

The light area represents that part of the earth where the sun is shining, while the dark area represents night. The line or edge between day and night is called the gray line. Astronomers refer to this line as the terminator. According to the 1987 ARRL Radio Amateur's Handbook, "Propagation along the gray line is very efficient." You can see the gray line worldwide at a glance while running the DX Advantage. If you dig around a bit in the handbook, you'll find that this applies to the lower bands such as 160 meter, 80 meter, and 40 meter.

Feature Packed

This program has *lots* of interesting features. You can just let it run in real time, which it gets from the clock in your computer. You can sit there and watch the time change minute by minute while you work DX. You may notice your local time is incorrect. MFJ sends the program out with the local time set to Universal Coordinated Time (UTC) which may not match your local time. An example will illustrate this. I live in Chicago and start running this program at 2030 hours Central Standard Time. The map will display UTC as 2030 hours and my local time as 1530 hours, the time difference between Chicago and Greenwich, England.

There are two ways to get the local time for your city to line up with the time displayed on the map. The first way is to lie to your computer. Set its clock to UTC and everything will line up. The second way is to change the parameter file to select your time zone. I'll discuss this method later.

Don't like to wait? There's an accelerator mode that speeds up the process. Just hit the F9 function key. Each change in the display represents a six-minute real time change. The time associated with each city will increase by six minutes every time a new gray line is calculated. You can increase or decrease the interval by pressing either the plus or minus key, respectively. The interval range is from pause to one week. I kept pushing the plus key until every change represented one week in real time. It was fascinating. The display went from summer to winter in just a couple of minutes. It gave me the feeling I could tinker with time and the solar system. Move over, Dr. Who.

The function keys act as toggles. Press to start, press again to stop. Another interesting feature is the position of the sun. Function key F8 toggles it on and off. I discovered that the sun only gets as far north as Key West, Florida on the longest day of the year. This means the sun was directly overhead on June 20 at noon in Key West. After that it starts its southward journey for the rest of the year.

Files and Maps

The DX Advantage comes with three different world maps. The default map is a file named LANDMASS.MAP. This map works best in all graphic modes. The program supports the CGA, EGA, and HERCULES modes. The CGA mode has some limitations, such as lower resolution. The TIMEZONE.MAP shows all twenty-four world time zones. The LATLONG.MAP shows latitude and longitude worldwide. These maps lose something in the CGA mode.

Each map can show a combination of up to 24 cities, zones, and areas. A zone is a time zone with a label attached to it, such as the central time zone. An area is an ocean such as the Pacific. You can actually customize what you want to appear on your map display.

The TERMINAT.PAR is an ASCII file containing all the goodies the TERMINAT.EXE program uses. You can make changes to this file using a wordprocessing program. You can even change the starting and ending dates for daylight savings time. *CAUTION!* Make sure you make a backup copy of the MFJ disk before making any changes.

I use Wordstar and open TERMINAT.PAR as a non-document file. This tells the wordprocessor not to add any extra text control characters. You can tell which options the program will use because they are enclosed by "<"and ">". (Less than and greater than signs.) For example, when your program arrives, the selected time will look like TIME 0>. Remove these signs from around TIME 0 and place them around your time zone. I placed them around TIME CENTRAL to make TIME CENTRAL>. This causes your map display to function in real time for your location. It's better than lying to your computer.

Use the same technique to select a city. If your home QTH doesn't appear on the map, just look up its latitude and longitude and add it to the list of cities. Remember to enclose it with the less than (<) and greater than (>) symbols.

The DX Advantage also runs in a "pop-up" mode. Both Wordstar *and* the DX Advantage are resident in memory as I type this review. When I press the ALT key and the T key at the same time, the map appears on the screen. The ESC key returns to Wordstar or whatever else is running. I tried loading Wordstar first, but that didn't work. When I loaded the DX Advantage first, then Wordstar, everything worked as advertised. The manual does caution you about using the program in a pop-up mode. It may not work with everything that way.

The manual is well written and easy to understand. After you play with the program a few minutes, the manual will make a lot of sense.

School Tool

While the program was written for hams, it's also a fine educational tool. In a school science class, kids could see directly why days are short in winter and long in summer. Looking at the position of the sun on the map display, even very young children can understand why it's cold in winter and warm in summer. More inquisitive young minds might wonder why communication is better along the terminator. What more could you ask of a simple product? It lets the OM work that gray line DX while it teaches his kids about the real world.

Thank you, Mr. M.F.J. for sending me this product for review. I found it entertaining, useful, and educational. You can order the DX Advantage from your favorite ham store or direct from MFJ Enterprises at the above address.

Hmmm, I stayed up pretty late writing this review. Time to check the DX Advantage. Look at that, a gray line from my house to Tokyo! Konbanwa. 73

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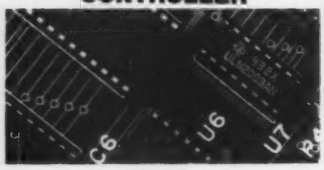

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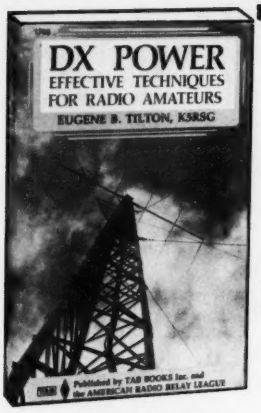
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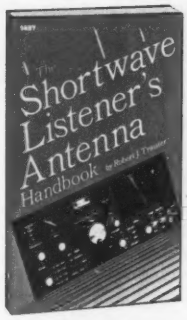

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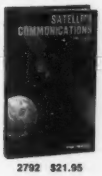

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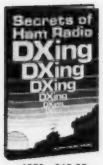

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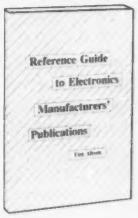

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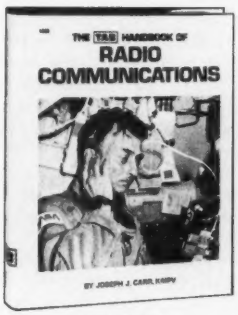

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CIRCLE 128 ON READER SERVICE CARD

Continued from page 61

they have to interest all amateurs, so that's no block to anything I might want to broadcast. There isn't anything I might be able to say on the air that won't interest some amateur somewhere—right?

But let's say that RAIN takes this League attack seriously. The solution to their problem is ultra simple—all they have to do is stop "broadcasting." Note, I said nothing about their stopping transmissions. No such thing.

No, you can say just about anything you want on the air—except you can't play music (and you can even send that legally if you do it the way I say)—and not have a worry in the world about the FCC monitors getting their (and your) bowels in an uproar. Easy—instead of making it a one-way transmission, just have a shill so you'll have a two-way contact. Then you can read the toady endless bulletins, with no proscriptions—no worry about how related to amateur radio the stuff is. Duck soup.

I seriously doubt that the FCC monitors check the ham bands anymore. The FCC seems to wish we'd go away, so they don't want to waste money upsetting us over anything as trivial as a world ham broadcasting network. Heck, with some repeaters sounding worse than anything I've ever heard on CB in my life, I know the FCC is out to lunch.

The next step might be for the League to get their OBS chaps to set up camp on the RAIN frequencies—a return to the old repeater war days mindset. Yes, I know about the intentional interference prohibition. I also know there isn't a DX operator who doesn't knowingly violate that rule virtually every day he operates, so don't bleeding-heart me with that weak oar.

Has the League met its match this time? This confrontation at Dayton could be the straw which will spark a frenzy of organization by RAIN, ending up with America having two (2) national organizations. Unless the spark burns the straw, of course.

Should I sit up here in New Hampshire fanning the flames—let you and him fight? Or should I throw some cold water to separate the combatants? Should I try to take this seriously? I'm pretty adaptable, but I don't think I could manage that wild a swing.

RAIN has a very major problem. I suspect it's a fatal weakness. They have their version of the League's W1AW and OBS system up and going, but they don't have a magazine. You can't make it go for long without a magazine. Ask the old NARC boys, if any are still around.

NARC

The National Amateur Radio Council was formed soon after WWII by the phone ops to fight the League's iron-fisted opposition to expanding the phone bands. CW Forever was the League cry. Hmmm, where have I heard that before? Can't remember, but it was somewhere.

The NARC grew rapidly and crushed the League opposition, achieving its aims—the expansion of the phone bands. The 80 m and 20 m phone bands were doubled. 40 m phone was opened. The League fumed, helplessly. But once their goals were won, the NARC faded away. I wish someone would write the history of NARC. I don't recall it ever being published. It sure didn't get into *QST*, I guarantee you that.

Other than for entertainment, what information might realistically be broadcast over an amateur radio network? Well, most ham news isn't of time value, so there's no practical reason for rushing it onto the air. Most news can wait for the ham magazines. But, yes, there are some timely new items which it makes sense to broadcast.

Much of the news in the Westlink Report—$22.50/yr (26X) by first class mail, 28221 Stanley Ct, Canyon Country CA 91351—is of time value. This information is broadcast by cooperating amateurs via repeaters in virtually every locality in America. It covers late-breaking FCC news, DXpeditions, propagation reports, satellite news, hamfests, and etc.

Another good source is the W5YI Report—$23/yr (24X) Box 565101, Dallas TX 75356-5101. W5YI also runs a huge VEC network, which is driving the League crazy.

Of course we're getting into the vaunted information age now, so accumulating data is all the rage. I've catered to this penchant with the Truly Exhaustive Index to *73*. This, for the first time, makes it easy to find virtually anything published in *73* quickly and simply.

What I think is really needed is on-the-air bulletin boards. It would make it possible for any amateur to instantly access any wanted information. I'm thinking in terms of contest rules, contest results, hamfest details (like who's speaking, how much the flea market costs, ticket prices, hours), FCC rule filing dates and details, DXpedition operating times, frequencies, QSL managers, commercial and foreign intruders in our ham bands for us to monitor and complain about, satellite schedules, repeater lists, etc.

The problem with any service like this is that it costs a bundle to get the information together—plus the cost of the equipment to handle it. Since one can't charge for an over-the-air ham service, there's no one to pay the tab. If we depend on it being done voluntarily, it's unlikely to be done well or to continue for long. Catch 22. Besides, the chap with the deep pockets needed to fund such a project would undoubtedly drop dead of shock when vigorously attacked by the League, blowing the whole deal.

"If we depend on it being done voluntarily, it's unlikely to be done well or to continue for long."

Yes, when there's an emergency, an amateur radio broadcasting service could be of great benefit. It might save us from the officious self-appointed hams with Haig complexes who tend to try and take over, usually screwing things up worse than if they shut up.

It would be nice if the League could get an emergency organization set up which works. Now I admit that I'm out of touch—heck, I only get on the air a few hours a week, and I only read four other ham magazines and the two ham reports, so there may be a secret emergency network out there ready to spring into action when a hurricane, earthquake or Amtrak crash happens. If there is such, and it honestly works, I'd like some details.

The RAIN approach, from that standpoint, is a good one. No emergency system is worth anything unless it's in common everyday use. When an emergency does occur, we'll all know where to tune in, and when (if our clocks are still running), if they establish a standrd frequencies and time for broadcasts. There's a whopping earthquake scheduled for California. When it hits, where will you tune for information?

We know of one other inevitable disaster which is coming—a terrorist nuclear bomb in Manhattan. That could, like the California earthquake, come at any time and we're as helpless in preventing it. So we should get as prepared as we can. I admit that the prospect of a bunch of retired old hams grabbing their walkers to try to cope with these emergencies isn't confidence-inspiring.

So, with at least four amateur radio broadcasting networks already in action, should we get the FCC to put a lid on this? Shall we let it proliferate until we have to set aside a sub-band for ham news services?

I don't want to suggest anything which will rile the League HQ chaps or my fellow League members. Hey, I'm looking forward to getting my 50-year pin this year! I sure don't want to screw that one up. You won't find a stronger League supporter than me—not even among the petrified minds of some directors.

Shouldn't I get something more than a little lapel pin after fifty years? American Express just sent me a huge coffee table book in honor of my thirty-year membership. I keep watching their ads to see if I'm going to turn up there as an unknown card holder from 1958. Not yet. Maybe I'm not unknown enough.

FCC Rules

Now, about the FCC rules. Let's not mess with them. If we try to favor one group or another with new rules, we'll end up with even more restrictive rules. Who knows, we could get as regulated as France, which is even worse than the USSR, when it comes to that.

You think about this ham broadcasting business for a while and then this fall I'll run an opinion poll to see what you think. Listen to the broadcasts. Let me know about any regular broadcasts or relays of broadcasts in your area so I can make a list. 73

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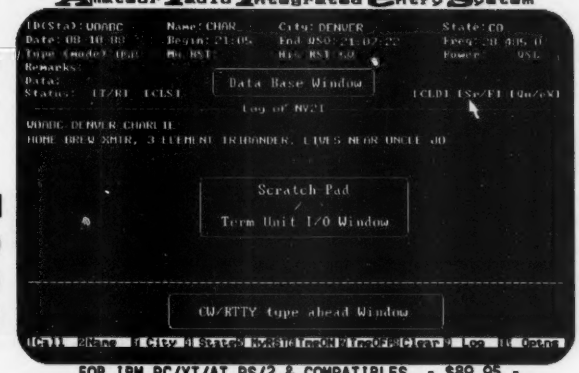

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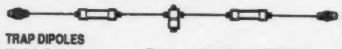

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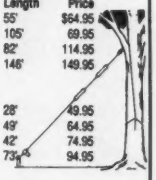

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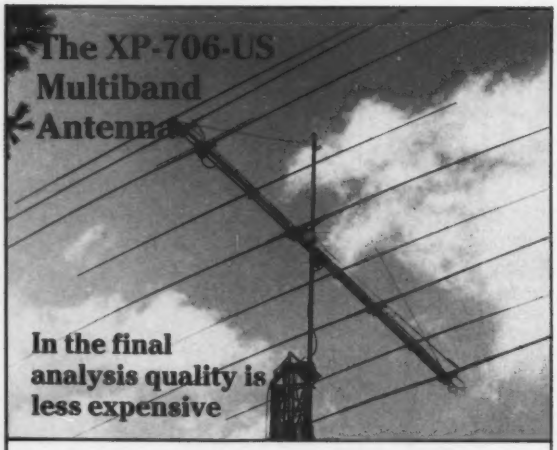

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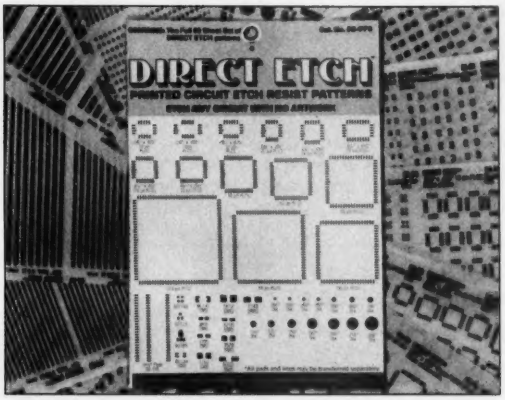
Compiled by Rebecca Niemela



PRODUCT OF THE MONTH

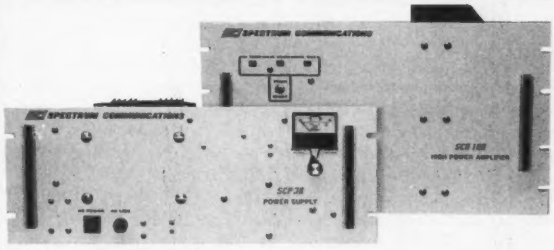
DATAK CORPORATION

Direct Etch™ from Datak allows the use to try different circuit layouts without changing the master art or refabricating. To make a circuit, patterns and donuts are first rubbed down with a ball point or spoon burnisher. Connecting traces are cut to length and transferred. The final circuit is spray or tank-etched in any standard etchant. The resist is removed by soaking the board in mineral spirits, then rubbing with a soft cloth.

The DE-973 Direct Etch™ set has 69 sheets of plastic etch resist patterns that transfer by pressure directly onto a copper-clad circuit board. Patterns include DIPs, "D," edge card and DIN connectors, TOs, .050" to .250" donuts, .014" to .125" wide traces, transistors, and a wide range of surface mount patterns. Each pattern is available separately as a refill set. The DE-973 costs $34.95. Refill sets of two sheets cost $2. Call *Terry Pflueger, 201-863-7667,* or write *The DATAK Corporation, 3117 Paterson Plank Road, North Bergen NJ 07047.* For more information circle Reader Service number 201.

RAD-COM

Rad-Com's Soft-Control software lets the user control the radio remotely from a PC keyboard via serial link. Using Soft-Control's simple menu, maintains the radio's memory channels, and add, delete, edit, save, and restore data from disk. Soft-Control is available now for the Kenwood TS-440S and IBM PC or compatible. Other versions will be available soon. Price, $59.95. *Rad-Com, 7958 Limewood, Pleasanton CA 94566. 415-462-4609.* For more information circle Reader Service number 203.

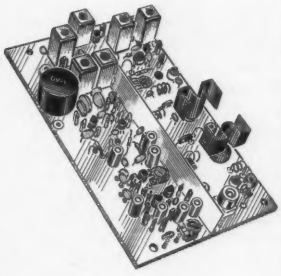


SPECTRUM COMMUNICATIONS CORP.

The Spectrum SCA100 150W VHF/100W UHF High Power Amplifier can be used with any 10–40W transmitter, repeater, or base station. It features massive, "behind the panel" heatsinks, automatic Hi VSWR Shutdown/"Bypass Mode" with 3x automatic reset circuit, and auto amp bypass in case of power failure or overheating. With tight RF shielding and heavy duty construction, this design includes new final transistors, which provide more stability. On 100W UHF the amplifier is available for 420–450 MHz; on 150W VHF, for 144–148 MHz. With a 30W input, the High Power Amplifier is $499 and with a 6–10W input, $640. Type accepted versions are available for commercial service.

The SCP30 is the companion power supply for the SCA100 High Power Amplifier. It is heavy duty with conservative ratings, has an output of 13.8VDC @25A continuous, 30A @70% duty cycle and 115/230VAC input. The 150W/100W Amplifier with the SCP30 power supply is priced at $895. Contact *Spectrum Communications Corp., 1055 W. Germantown Pike, Norristown PA 19403-9616; 215-631-1710. TELEX 846-211.* For more information circle Reader Service number 216.

HAMTRONICS, INC.



Hamtronics has a series of transmitters for the 902–928 MHz band which complements the R901 FM Receiver. The TA901 Exciter, a version of the TA451 UHF FM, runs a minimum of 1.5W output, with doubler, driver, and output stage line-up using surface-mount microwave transistors and capacitors.

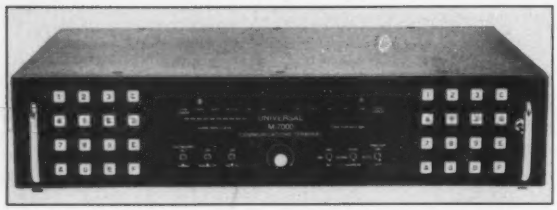
The LPA901 Power Amplifier uses a standard heatsink and broadband power module, which requires no tuning, to produce 8 to 10W output and requires only 100mW of drive from the Exciter.

The TA901 and the LPA901 are both available at $269 each, wired and tested. For more information on 900 MHz transmitters, call *Jerry Vogt at 716-392-9430.* For a catalog, send $1 for postage ($2 overseas) to *Hamtronics, Inc., 65-F Moul Rd., Hilton NY 14468-9535.* For more information circle Reader Service number 202.

MOTRON ELECTRONICS

The MoTron Auto-Kall HF-Alert is a calling/alerting system designed for use with HF SSB/CW. It will also work on VHF/UHF, FM/AM, CB, and marine HF/VHF. 225 code combinations are possible. The HF-Alert allows the user to be contacted by radio without his having to constantly monitor the bands.

The HF-Alert comes with mobile mounting bracket, 117 VAC power supply for base operation, and an audio patch-cord. It is easily set up by connecting the patch-cord from the radio's external jack to the HF-Alert's audio input. A built-in speaker is provided or an external speaker can be used. The calling signal is sent either by directly keying a CW transmitter or by placing the microphone next to the speaker. Price, $129.95. *MoTron Electronics, 695 W. 21st Ave., Eugene OR 97405; 1-800-338-9058 or 503-687-2118.* For more information circle Reader Service number 207.



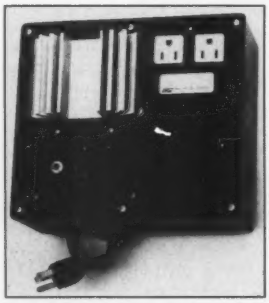
UNIVERSAL SHORTWAVE RADIO

Universal's M-7000 is a code receiver-converter that accepts multiple codes from a shortwave receiver and converts these codes into a display on a video monitor or into hard copy from a printer. It requires no computer or software.

The codes/modes supported by the M-7000 are: Morse, 5–120 wpm; Baudot, 45–250 baud; ASCII, 75–1200 baud; TOR, SITOR Modes A and B, AUTOR; ARQ, two and four channels, 86–200 baud; VFT, four modes of FDM; Three Shift, Russian Cyrillic on video; Facsimile, four drum speeds and three I.O.Cs for printout on a parallel dot matrix printer. As other codes develop, they may be added by changing ROM. Price, $999. The Real Time Clock and FAX Video Mode are available as options. For detailed specifications, call or write *Universal Shortwave Radio, 1280 Aida Drive, Reynoldsburg OH 43068; 1-800-431-3939 or 614-866-4267.* For more information circle Reader Service number 208.

ELECTRONIC SPECIALISTS, INC.

The Soft-Start AC Power series was designed for equipment with large start-up current and surge-sensitive requirements, such as large power transmitters or ultra hi-fidelity vacuum tube power amplifiers. A Soft-Stop (ramp-down) option and manually adjustable response-time option are available. Soft-Start models begin at $300. *Electronic Specialists, Inc., PO Box 389, 171 S. Main St., Natick MA 01760; 800-225-4876.* For more information circle Reader Service number 205.



AMERICAN RELIANCE INC.

American Reliance announces their new Telecom Test Set, the AR-180T. It measures level, noise, AC and DC voltage, DC current, and resistance. The unit will also generate four precision tones for frequency response measurements.

For the AC voltage and level measurements, a true RMS AC converter is used. For noise measurements, the unit incorporates a built-in "C-Message" noise-weighing filter. The AR-180T is switchable between either 600Ω terminated or bridge measurements at an impedance of 1 megohm. An audible continuity beeper is included. The suggested list price is $249.95, which includes test leads, carrying case, operator's manual, battery, and spare fuse. *American Reliance Inc., 9241 E. Valley Blvd., Rosemead CA 91770; 818-287-8400.* For more information circle Reader Service number 209.

AEROSPACE CONSULTING

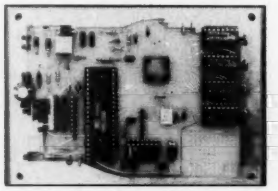
LOGWRITE is a new amateur radio logging program from Aerospace Consulting. It has a split-screen feature that allows the user to use the computer keyboard to jot down notes or copy code while using the program to keep the log book records. LOGWRITE is entirely menu-driven and fully compiled. It runs on all IBM PCs and compatibles.

Log information is entered into blocks at the top of the screen, while the rest of the screen is used for text and program prompts. The program contains a 400-line buffer. Other standard features are wordwrap and backspace-correct. The user can print, edit, and search for callsigns or prefixes, and have the time and date of contacts automatically recorded. Price, $24.95 (PA residents add $1.50 sales tax). Contact *Aerospace Consulting, PO Box 156, Gwynedd PA 19436. MasterCard and Visa orders are accepted at 1-800-345-4156, Ext. 54.* For more information circle Reader Service number 215.

QRZ INDUSTRIES

QRZ Industries introduces the Voice Box and the Mini Voice Box kits, especially designed for DXers and contesters. The Voice Box digitizes and stores an operator's natural voice, which can then be recalled. A total of 8 different phrases and operator voices can be recorded for up to 32 seconds. The Voice Box uses a 32 kHz sampling rate and several filters. It keys the PTT line to the transmitter or transceiver during playback and allows normal VOX operation. It has a switchable built-in microphone preamp to accommodate a wide variety of microphones. The audio output level to the transmitter is continuously adjustable.

Currently, the Voice Box and the Mini Voice Box are only in kit form. The kits consist of assembled, tested, working boards with complete insructions for installing the board in a suitable enclosure. Some standard off-board components (pushbuttons, toggle switches, microphone, etc.) are required. Introductory price, $95 for the Voice Box and $55 for the Mini Voice Box kits. Add $10 for S&H, $5 for C.O.D., SC residents add 5% sales tax. Please state name of publication where seen when placing order or requesting information. *QRZ Industries, PO Box 160, Piedmont SC 29673.* For more information circle Reader Service number 210.



ALINCO ELECTRONICS, INC.

Alinco's Quad Pod was designed for the medium-size antenna system, especially light-weight HF beams, VHF/UHF antennas, and OSCAR antenna systems. With motor mounts, dual-wall construction, four guy points, steel bolts, aluminum construction, and a provision for thrust bearings, the Quad Pod is stable and durable. The ETS-150 is priced at $83 and the ETS-210 is priced at $150.

Also new from Alinco is the DJ-100T 2 meter handheld tranceiver. It has 10 memories, LCD display, dip switch programmable sub-tones, built-in converter, multiple battery packs, 16-button DTMF pad, BNC connector, and it has easily expandable frequency coverage. Price, $299. Write or call *Alinco Electronics, Inc., 20705 S. Western Ave., Suite 104, Torrance CA 90501; 213-618-8616.* For more information circle Reader Service number 204.

Index: September 1988 Issue #336

10 meter band 4
1N914 27
2N3053 32
2SC777 32
30 meter QRP transceiver 30–34
339 comparator 27
3CX800 triodes 87
4-1000A 87
4022 selector 28
4066 bilateral switch 27, 29
4503 tri-state buffer 29
555/7555 clock 28
7289 cavity amp 87
8877 amp 87
9M8PV, Andy 83
A Index 77
A61AB 71
AC9E, Dan Eggert 30
Alford Slot antenna, correction 60
aluminum foil antenna 14
Amateur Satellite Report 178 68
Amplifier Lock-Out Circuit 36–37
AMSAT NA 68
AMSAT OSCAR 9, 67, 68
AMSAT-DL 67
antenna systems congruency 10
antenna tuning 10–11
ARRL Antenna Handbook 75
ARRL Radio Amateur's Handbook 49
ATV User Net 60
Australia 9
balloon supported antennas 18–20
balloon launches 9, 60
BNC connector 42
Brass Racer 40
Butternut Electronics, Inc. 16
Classroom Net 48, 57
CMOS CHIPS 28
coax 10
CT-90 portable frequency counter 42
CURTIS 8044 IC Keyer 40
CW keyers 40
Cycle 21 77
DARA scholarship 9
Dayton ARA 9
DIGI-KEY 34
dipole 16
Dominican Republic 83
DPDT switch 30
DROs 87
DX Advantage 49
DX Bulletin 71
DX Net Control 60
DX 4, 14, 23, 60, 68, 74, 75, 77
education 48
El Salvador 83
Encomm, Inc. 87
England 9
F2CW, Jacky Calvo 71
FCC 6, 52
FETs 27
Field Day 68
FN27 87
FN42 82
FP/W2NSD 57
French Guiana 67
frequency counter 42
Frontier Microwave amp 87
FSTV Contest 60, 61
G5RV 14
Germany 9, 82, 83
ground systems 74–75
ground-plane antennas 74, 75
Gunnplexers 87
Henry 2004 87
HF mobil operation 22
HF5B antenna 16
HI3UD 83
HI5@@UD 83
horizontal antennas 74, 75
IC-251/275A/375A/475A/575H 87
IC-735 37
IC-761 driver 37
impedance 11
ionosphere 4, 77
Ireland 9
Jameco Electronics 34
Jan Crystals 34
Japan 83, 87
KARL 83
Kenwood TS-440S transceiver 71
Korea 83
KT2B, Pete Putman 87
LF351 Bi-FET op amp 27
LF353 27
LGOA 9
LM-386 IC 30
LMW-13S transverter 87
magnetic field index 77
Malaysia 83
MARS 23–24
MFJ Enterprises, Inc. 49
Microwave Modules MMT 87
Morse Code 30, 40, 71
Mouser Electronics 30, 34
MUF 4, 77
N4JPG, Mike Miller 48, 57
N6HYK, Leon Fletcher 89
NA5E, Larry Ledlow, Jr. 22, 40
NARC 52
Net-Rom 9
NF@R, David F. Gauding 14
NORD Link 9
Nowak, Phil 49
omni antenna 60, 67
op amps 27–29
packet 9, 91
patenting 39
Phenix, Richard 82
propagation 4, 49
QRP 14, 30
QSL card selection 44–46
radials 12, 74, 75, 91
Radio Shack 275-241 relay 30
RAIN 6, 52
Ramsey Electronics, Inc. 42
RFM-003/005 36–37
ROHN 25 87
RTTY.BAS, correction 57
Russian CW QSOs 82
sky/skip waves 4
SO-238 connector 36
solar flux 77
Spec-Com Journal 60
SSB Electronics LT-23S/33S 87
stacked antennas 87
SWR 10, 11, 91
Ten Tec Argosy 14
terminator 49
THL-250U 87
TL081 Bi-FET op amp 27
TL081/091 sensors 28
TL081/2N3904 ..... 27, 29
TL091 NFET op amp 27
TL091/2N3906 ..... 27, 29
Trevose Electronics 87
tribander 16
troubleshooting 42
United Arab Emirates 71
Universal Permit Application 82
USATVS ATV Conference 60
USSR callsign system 82
USSR stations 82
Vanuatu 83
vertical antenna 12, 16, 49, 74–75, 91
VHF QSO party 87
VIBROPLEX 40
VLSIC semiconductors 42
VP2ML, Chod Harris 71
W1GV, Stan Gibilisco 18
W1XU, Jim Gray 77
W1ZM, NNNCEN/0WAJ, Gerard J. Scarano 23
W3ZC, John Lawson 10
W4RNL, L.B. Cebuk 27
W5PFG, W. Max Adams 39
W5YI Report 52
W6AAQ, Don Johnson 22
W7XU, Arliss N. Thompson 74
WA4BLC, Bill Clarke 16
WA4QXH, Steve Roberts 57
WA5ZIB, Andy MacAllister 67
WA6OHX, Jennifer Roe 44
WB2JKJ, Joseph J. Fairclough 48, 57
WB2JKJ 48
WB9RRT, Larry R. Antonuk 42
WB@QCD, Mike Stone 60
WEISarc 82, 83
Westlink Report 52
whip antenna 67, 68
WM. Nye Co., Inc. 36
WWV monitor 30
Wyman Research transmitter 60
Yaesu FT-757GX 71
Yaesu FT-101 87
yagi 16, 68, 87
YS1GMV, Mario Moran Vega 83
YS1TG, Mario Giolitti Tona 83
Zener 27

LETTERS

Number 21 on your Feedback card

From the Hamshack

QSL Correction

W3GXK is NOT the QSL manager for FP/W2NSD.

Please send all FP/W2NSD QSLs to WGE Center, Route 202 North, Peterborough NH 03458.

RTTY.BAS Program Correction

The RTTY Loop Program published in the January 1988 issue of *73* has some mistakes. In order for the program to run, there must be an @ after the word PRINT on six lines. On the line that begins with "310," place an @ after each PRINT. The other five lines are corrected as follows:

```
720 CLS:PRINT@229,
    "LOADING";A$
830 CLS:PRINT@229,
    "SAVING";A$
850 PRINT@293,"ARE YOU
    SURE(Y/N)";:INPUT S$
870 PRINT@293,":
    OPEN"O",F,A$
960 PRINT@269,";:GOTO 210
```

In addition, the bold dots on the lines that begin with "120" and "310" should be asterisks—*.

Glenn Little
Goosecreek, SC.

Congratulations!

A note to let you know that one of your subscribers (me) was selected Security Engineering Officer of the Year for 1987 by the U.S. State Department.

What is interesting is that this is the second year in a row that a ham has taken this award, which is the highest award earned in this business. Last year it was won by Ken Cosher, whose call I forget, and who is now doing the job and is on the air from Athens, Greece.

Security engineers in the State Department are responsible for everything from technical deterrence against terrorists to protecting our embassies and consulates from extremely sophisticated bugging operations. A lot of the knowledge we gain about RF as a result of amateur radio serves us very well, especially in the latter area.

Frank Bates AA6C
American Embassy, Ankara

Vote on the S

I enjoy the new column "Welcome, Newcomers!" and respect anyone who is willing to take on the responsibility of instructing newcomers. The things that are taught now are always remembered. Good and bad.

When I was preparing for my first ticket, I was strongly urged by my Elmer to avoid adding an "s" to the numbers 73 and 88. These terms are already plural and the addition of an "s" is a redundancy (and an " 's" is even worse). An "s" after 73 is no more appropriate than adding an "s" after QSB.

I have noticed since the beginning that KA1HY (now NS1B), does recommend the use of the "s" following the 88 and 73. I fear that he is teaching bad manners. Keep up the good work.

Brent Tyndall NW@T
Springfield MO

A number of readers have had similar comments. I believe the "s" is a matter of convention. Some use it, some don't. Why don't we vote on it? Send your votes in by 1 October. . . de NA5E

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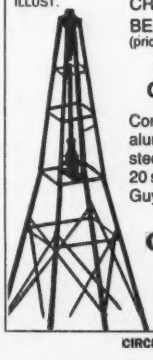
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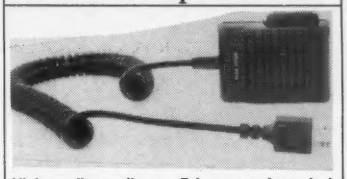

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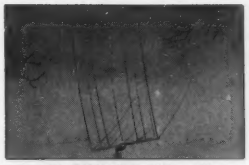

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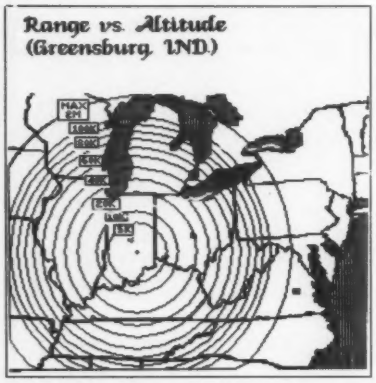

Photo A. The balloon's flight range and altitude chart.

Mike Stone WB0QCD
P.O. Box H
Lowden, IA 52255

In the real world, TV stations do occasionally go "off the air." Yes, there was no June ATV in *73 Magazine*. I hope a lot of you wrote to *73* to ask what happened. If you didn't, and if you would like to see this column continue, take pen in hand and write your comments to *73*. Thanks.

August Fast Scan TV Contest

As we move toward fall, with summer DX openings falling behind us, we find August at the peak of Fast Scan UHF TV long-range DXing. The *Spec-Com Journal* and *The USATVS* sponsor a live Fast Scan TV UHF Operation contest each year in late August. Included is some limited information about the annual FSTV contest event. Please send an SASE to me for more details or check into the Tuesday night USATVS sponsored National ATV User Net on 75 meters (3.871 MHz WB8ELK Net Control).

Hamfest and ATV Conference

It appears that we will be holding our annual Fall USATVS ATV Conference and Workshop this year in York, Pennsylvania, in cooperation with the 33rd annual York, PA Hamfest on September 24 and 25, 1988 at the York Fairgrounds. Talk-in is on 146.37/.97 or 147.93/.33 repeaters. For a flyer and additional information on the York, PA Hamfest, write York Hamfest, P.O. Box W, Dover, PA 17315, or call 717-528-8412. You may also contact ATVer John Shaffer W3SST in that area. We will have a number of ATV guest speakers at a Saturday (September 24) evening conference and possible banquet. If you are within driving distance, come over and attend our ATV Workshop sessions. The last one we had in York was a great success!

Helium Balloon Special Event Launched

The W9PRD Indiana helium filled weather balloon, carrying a two meter CW ID beacon and a 439 MHz ATV transmitter, was launched successfully from Greensburg, Indiana on Saturday June 4. Hundreds of ATVers saw the two computer generated graphic pictures designed, and the module built, by Bill Brown WB8ELK from Findley, Ohio.

Launch time was 8:59 AM, right on schedule from Germantown's private airport near St. Paul, Indiana. Power on FSTV was 1.5 watts peak on a Wyman Research transmitter. No 4.5 or on-carrier audio subcarrier was sent. ATV polarization was horizontal from a beach ball "omni" antenna. The two meter frequency for the CW beacon was at 144.340 MHz FM, and it was vertically polarized. Power on two meters was three times higher than last year's Ohio WB8ELK balloon flight, at 400 milliwatts on a Johnson HT transmitter. The balloon itself stood 6'5" in diameter on the ground and expanded to 34' at 100,000 feet. Ascent was tracked at approximately 20–25 knots at 750 feet per second. Maximum "burst" height was 120,000 to 130,000 feet at 23.6 miles upward. 87 cubic feet of helium was used at an approximate cost of $200.

The capsule, a styrofoam container housing the electronic components, was 16" by 8" by 8." It weighed 2.3 pounds. With 7.5 hour lithium batteries by SAFT, it gave the unit 12–15 VDC power. This special battery can handle an improved −67 degree operating temperture over the Ohio 1987 flight. Long strips of reflective aluminum dangled below the balloon to help radar readings on a local weather radar tracking system. The balloon traveled south toward Louisville, Kentucky during its voyage (about 60 some miles from where it took off). Chase teams followed the balloon while stations from all over the country gave their sight and audio beam readings to Net Controls W9PRD, WB8ELK, WA3USG, and W9NTP on 3.871 and 7.155 MHz. The 7.155 MHz frequency drew a lot of oppostion, as it is an Advanced class and above frequency.

P3 to P4 pictures were received in Iowa at 80,000 feet 300 miles away. After the flight, WB0QCD, N9AEP, W9DNT, WD0BCE, WB0OLX, KA0JAW, and W0RPK in DesMoines reported hearing the CW ID some 450 miles away! I will list more callsigns that heard or saw the balloon with computerized pictures in next month's column. There might be another flight scheduled for late this summer or early fall. Stay tuned to 3.871.

ATV Regional DX HF Coordination

The 75 meter 3.871 MHz frequency has been a pretty popular ATV talk hotspot. The mornings and late evenings for midwest and eastern ATV Dxers is an especially good time to check out UHF band propagation and to keep in touch with each other. If you suspect or participate in a band enhancement of full-fledged opening, coordinate your DXing activities on 75 meters! 144.340 MHz FM or 144.310 MHz on SSB is also used extensively for talk communications. Until we all can agree on a General class operating frequency, 7.155 MHz is the place to be on 40 meters. To direct TV pictures in an organized manner, it is important to declare a DX Net Control in your local area.

More Slot Antenna Information Coming

In next month's column, I will cover the continued success of W9DNT and K4NHN with their Alford Slot antennas. Note that there was a serious error in the W9DNT dual Slot graphics printed a few months ago. The circumference of the Slot antenna was shown to be 4 inches. However, it has a 4-inch *diameter*—not circumference. Sorry for the error.

The May 1988 issue of *The Spec-Com Journal* featured two pages on W9DNT's Slots, including a new version for the 902–928 MHz band. This information will be presented in the next issue of *73 Magazine*. You can also sign up for a subscription to The ATVers Journal, *Spec-Com*, for just $20 per year (PO Box H, Lowden IA 52255).

August Fast Scan TV Contest

If you are serious about entering and working this annual FSTV Contest, send the USATVS an SASE at the *Spec-Com* address mentioned earlier, and we will send you all the latest information about the event, including a contest entry form and logsheet! Check into the 75 meter National ATV Users Net on 3.871 MHz on Tuesday evenings for more information and updates. Many will be monitoring that frequency during the entire contest day and night for any DX openings.

The 7th Annual USATVS sponsored "North American Fast Scan TV QSO and DX Contest" will be conducted during the week of August 29 through September 4, 1988, from Monday morning (0001 Eastern time zone) to Sunday night (2400 Eastern time zone). Those in the Central, Mountain, and Pacific time zones may start the contest on the Eastern time zone start/end times. As in past years, the object of the contest is to work as many Fast Scan UHF TV stations as possible on the 420, 902, 1240 and above amateur radio bands, and to work as far as possible to obtain the best TV signal and audio transmissions. But most importantly, to have fun!

Scoring Details

The contest scoring is understandably a bit complicated, but it makes sense if you list it properly on paper. Try a few samples before actually working the contest. **Contact Scoring:** The USA is broken down into six zones. The geographical boundaries are used only for selecting Regional Area Winners (see USATVS Contest Information and Logsheet). Simplex contacts are highly recommended, although an ATV/R station is allowed. A substantial penalty exists for "repeater or relayed" contacts. For the first time, a special 500 points bonus exists for the promotion of "FM signal contacts!"

Initial contact **Received Base** score: 100 points. Color, add 50 points. Audio (of any type i.e. subcarrier, on-carrier, independent carrier, or another band, such as

two meters), add 25 points. Initial contact **Transmit Base** score: 100 points. Color sent and received, add 50 points. Audio sent and received, add 25 points. Add both **Received** and **Transmit** scores. Add a 500 point bonus on both the R/T signals if contact was made on true two-way FM. If AM slope detection of the transmitted FM signal is received, the receiver takes a reduced 300 point bonus (the transmitting FM station gets to claim 500 on both T/R). **Deduct** 50% if contact was made through a repeater. Then take this score times a **Band Multiplier** times 2 for the 900 MHz band, times three for 1240 MHz band, times four for 2300 band, etc. Finally, take this total score times a DX Multiplier in 25 mile increments: Times 2=25 plus miles, times 3=50, times 4=75, times 5=100 plus miles, etc. This will be your final score.

The USATVS suggests that when submitting your ATV Contest logsheets, list (left to right) as follows: Number of Contact, Time, Callsign, Name and Location, Miles, P/C/A Signal, Receive Base, (FM RCV Bonus), Color, Audio, Subtotal, P/C/A/ Signal, Transmit Base, (FM XMT Bonus), Color, Audio, Subtotal, Combined R/T Base Subtotal, Penalty,

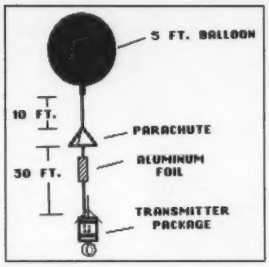

Photo B. A diagram of the W9PRD Indiana helium filled weather balloon.

Subtotal, Band Multiplier, Subtotal, DX Multiplier, Final Score and Comments.

Declare your station as a Single-Operator Entry or a Multi-Operator Entry (list all operators) and note your location. All TV contacts must be made on recognized UHF Fast Scan Television operating frequencies. Callsign station ID and signal report "exchanges" should be done on the TV Video picture. Use USATVS standard P-Signal, Color and Audio report signals (1–5 levels). Newly introduced, Color signal reports include C1=Weak Intermittant Color to C3=Good Locked Color to C5=Excellent bright and bold, full color. An A1–A5 Audio reading report, i.e., A1=Very weak, low-level, intermittant audio to A3=Good readable audio to A5=Full quieting audio signals, should be used. Log readings such as P5/C5/A5 may be listed and accepted on your contest logsheets.

Only one Ham-TV station per contact per band may be claimed in the logsheet, although you may work and log the station as many times as you wish to obtain the highest possible score. Circle claimed entries at the final score. A contacted station may be worked again on another band for additional contacts. Crossband contacts are allowed. All submitted logsheets must be completed in final scoring. The use of signal enhancers, color processors, preamps and amplifiers is authorized. Contacts with Remote Transmitter stations may count for receive only. Repeater contact distance must be calculated to the repeater transmitting site only, and not onto the viewed station (a possible advantage for close range stations). Absolutely verified and confirmed (on/off tested) SYNC bar sighting contacts may count as a legitimate contact. Non-video TV picture but "on-carrier" (modulated within a TV signal) may be counted for audio level scoring only).

There will no doubt be some last minute changes, so keep in touch via the 75 meter HF ATV Users Net or obtain the official USATVS ATV Contest Entry/Logbook sheet. You don't have to be a member of the USATVS or a subcriber to *The Spec-Com Journal* to enter or win this contest. All USATVS sponsored North American FSTV Contest entrants will receive framable 8" by 10" certificates! The station with the farthest verified contact wins a 1-year subscription to *Spec-Com* and certificate. First Place winners from each of the six regions will receive 2-year subscriptions and certificates of recognition. The First Place winner for the country receives a 3-year subscription to *Spec-Com*, a certificate, a trophy award wall plaque, and all fame and notoriety in *73* and *Spec-Com!* Contest postmarked log entry submission end date is September 10, 1988.

Good luck on the contest! Dust off those amplifiers, get up the biggest antenna array that your tower can handle, and have plenty of coffee! This year's annual contest promises to be one of the best ever! 73

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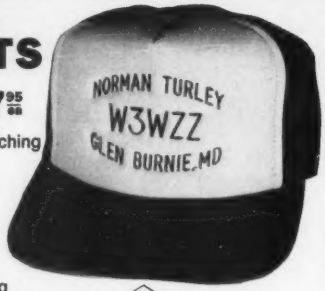

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• Covers 100 MHz to 199.999 MHz in 1 kHz steps with thumbwheel dial • Accuracy +/– 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • External FM input accepts tones or voice • Spurs and noise at least 60 dB below carrier • Output adjustable from 5-500 mV at 50 Ohms • Operates on 12 Vdc @ ½ Amp • Available for immediate delivery • $429.95 delivered • Add-on accessories available to extend freq range, add infinite resolution, AM, and a precision 120 dB attenuator • Call or write for details • Phone in your order as fast COD shipment.

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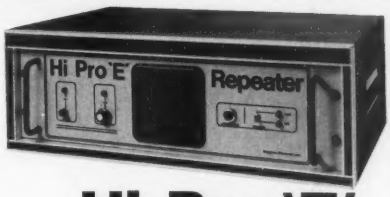

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• THIS SYSTEM CAN BE EXPANDED AT TIME OF PURCHASE OR CAN BE AN AFTER-PURCHASE ADD ON. THE ADD ONS ARE—HIGHER POWER, 110/220 VAC POWER SUPPLY, IDENTIFIER, AUTO PATCH, OR COMPUTER CONTROLLERS. IN ADDITION TO THESE ADD ONS AN ADDITIONAL RECEIVER AND TRANSMITTER CAN BE MOUNTED INTERNALLY FOR USE AS CONTROL LINKS, REMOTE BASE OR DUAL BAND OPERATION, ETC.

AN EXTENSION PANEL IS AVAILABLE FOR LOCAL MONITORING OF THE REPEATER AND CONTAINS ALL NECESSARY METERING, STATUS LIGHTS AND INDICATORS. ALL ADD ONS ARE AVAILABLE FROM THE COMPANY AND ARE COMPLETE INCLUDING INSTRUCTIONS.

Hi PRO

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SUPERIOR RECEIVER AND TRANSMITTER SPECIFICALLY DESIGNED FOR REPEATER SERVICE.

ADJUSTABLE TRANSMITTER POWER, FROM 1 TO 25 WATTS MINIMUM OUTPUT WITH EXTREMELY COOL OPERATION.—AUTOMATIC BATTERY BACK UP SYSTEM CAPABILITY.WITH BATTERY CHARGING AND REVERSE POLARITY PROTECTION.—NOW WITH A FULL COMPLIMENT OF INDICATORS AND STATUS LIGHTS.—100% DUTY CYCLE—ADVANCED REPEATER SQUELCH **NO CHOPPING, POPPING, OR ANNOYING REPEATER KEY UPS DURING LIGHTNING STORMS.**—DIE CAST ALUMINUM R.F. ENCLOSURES —SMALL SIZE 5¼ x 19 x 13 "—HIGH QUALITY LONG LIFE DESIGN.

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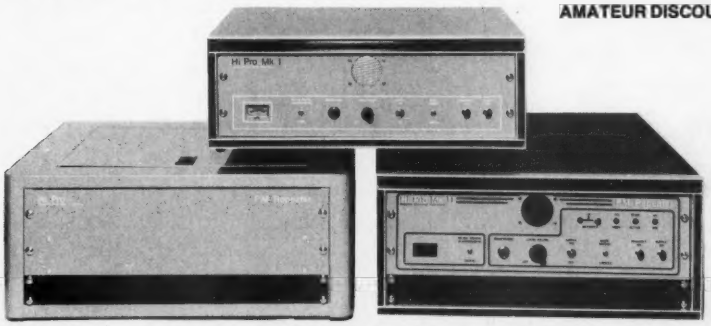
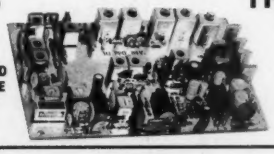


Hi Pro

TRANSMITTER AND RECEIVER

USED IN ALL HI PRO REPEATERS



ASSEMBLED SMALL SIZE 3¾ x 6¼"

HI PRO TRANSMITTER DESIGNED FOR REPEATER SERVICE WITH EXCELLENT AUDIO, STABILITY, HARMONIC REJECTION AND LOW NOISE

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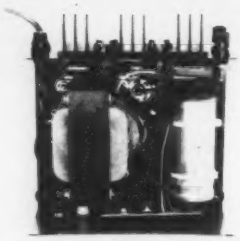

INSIDE VIEW — RS-12A

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models **except RS-3A, RS-4A, RS-5A.**
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
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- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

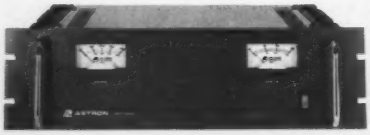
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM SERIES



MODEL RM-35M

19" × 5¼ RACK MOUNT POWER SUPPLIES

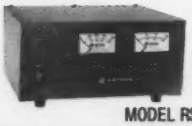
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4¾ × 5¾	4
RS-4A	3	4	3¾ × 6½ × 9	5
RS-5A	4	5	3½ × 6⅛ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7½ × 10¾	10
RS-10S	7.5	10	4 × 7½ × 10¾	12
RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

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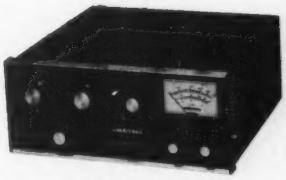
ATR-15 TUNER



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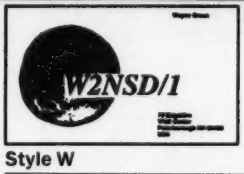
QSL Cards



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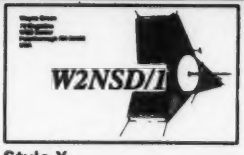

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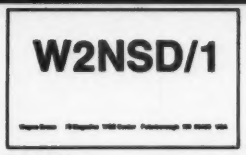

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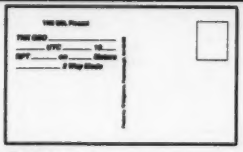

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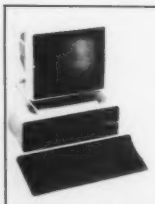

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Houston, TX 77083

Cinq, quatre, trois, deux, un, feu. . . allumage. It's up! AMSAT OSCAR 13 is now in orbit and available for use!

On the morning of June 15th, Europe's largest Ariane launcher rose majestically from the jungles of French Guiana. Thousands of amateurs around the world monitored the launch via the AMSAT Launch Information Service on the HF bands or through VHF and UHF repeaters connected via phone lines to the network. Others saw the launch live from Kourou using C-band satellite TV dishes or on cable from C-SPAN. The live transmission direct from the launch site gave excellent information on the launch vehicle statistics with detailed descriptions of the payloads. With the AMSAT broadcasts and the available TV coverage, mission V-22 was quite a multi-media event.

Although weather was a concern in the days prior to June 15th, on the morning of the launch, skies were clear and all systems were GO. As the countdown proceeded smoothly, it looked like the launch would go off without a hitch. At just under six minutes to go, however, the countdown was stopped. A red light had come on. Seven minutes later, after a minor ground equipment misconfiguration problem had been resolved, the count continued. Listening to a countdown in French is different, but the result is the same. In a magnificent blast, the strange, yet powerful, rocket began its ascent. With a mixture of liquid and solid-fuel engines blazing and insulation panels falling away like a molting skin, the sight was impressive. Ground cameras did a good job, but the chase helicopter shots were better. All looked well for the ambitious Ariane 4 program.

There are many changes in the Ariane 4 compared to earlier Ariane launchers. They include a longer first stage, a new equipment bay, larger payload fairings, and structural improvements in the second and third stages. Several variations of the strap-on booster system allow the rocket to be configured for different payloads. Up to 8160 pounds can be sent to Geostationary Transfer Orbit. The June 15th launch included two solid-rocket boosters and two liquid-fuel types. The combined mass of the payload for this mission, V-22, was 7720 pounds. The Ariane 4 will be the workhorse for Arianespace operations through the 1990s.

At the control center, there were no congratulations and cheers until the last satellite was deployed. The HM-7 third stage engine was responsible for three of Ariane's four failures. Everything was perfect this time. The payloads were deposited into the desired GTO with exceptional accuracy. The orbit had a perigee, or low point, of 137 miles and an apogee, or high point, of 24,593 miles.

Figure 1. Final orbit after last kick motor burn. Apogee is over the equator, drifting toward the north.

Photo A. OSCAR 13 spaceframe in construction in Colorado.

Phase 3C, now A-O-13, was one of the three satellites awaiting further orbit modification. The European Space Agency's Meteosat P2 weather satellite and Pan American Satellite 1 were the primary payloads. Both were boosted to their final geostationary destinations at 10 degrees West and 45 degrees West respectively.

OSCAR-10 remained in GTO till June 22nd. AMSAT-DL, (West Germany), fired the liquid fuel kick motor while the new hamsat was at apogee over the Indian Ocean. This was the second time ever that an amateur radio satellite had fired a rocket motor in space. Many recall that AMSAT OSCAR 10's engine did not fire correctly. A wiring error caused the engine to use all the fuel in one burn.

OSCAR 13's first burn was flawless. It lasted 50 seconds and raised perigee to 680 miles. Without this maneuver, the satellite would have lasted only a few months until atmospheric drag took its toll. Even if no further orbit modifications were desired, at least the satellite was safe from an early demise.

The second burn, in early July, lasted much longer, boosting the inclination close to 57 degrees and further raising the perigee to over 1300 miles. All of the remaining fuel was used in this five minute burn. The originally planned perigee was 930 miles. Studies by AMSAT-DL showed a better perigee to be in the range between 1200 and 1500 miles. Although the proton radiation is 10–20 percent greater at the higher perigee, the electron density drops by 50 percent. This change in the final orbit also allows better coverage for those in the southern hemisphere.

Following the final burn, OSCAR 13 was spun down from 60 rpm. Both spacecraft stability during the kick-motor burns and fuel tank flushing required the high spin rate. It also helped flush the fuel tanks. Normal operation and reorientation, however, doesn't require a high rotational speed.

OSCAR 13's health is good. Telemetry reports all temperatures, voltages and currents within specification. The experience gained from the operation of OSCAR 10 allowed appropriate design modifications for the new satellite. Thermal blankets are positioned more precisely, and the new radiation-hard memory, donated by the Harris Corporation, provides 1000 times better resistance to irreversible memory damage. Onboard programming immediately logged and corrected the few "soft errors" in the memory chips caused by solar flares.

The satellite is ready for use. There was a frequency chart in the June 1988 Hamsat column. A table of the transponder frequencies can also be found in AMSAT President Vern Riportella's article "Introducing Phase 3C: A New More Versatile OSCAR" in the June 1988 issue of *QST*. The values shown will be fine tuned after the satellite's circuitry has stabilized.

Mode B downlink frequencies were used during the orbital maneuvers and testing phase of the satellite. This activity on two meters gave many a chance to listen to the newest hamsat via the general beacon on 145.812 MHz. Signals were weak because they issued from the omni-directional

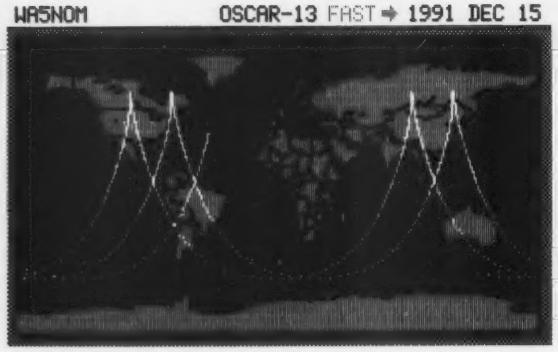

Figure 2. Three and a half years after launch. Apogee is at 57° north latitude.

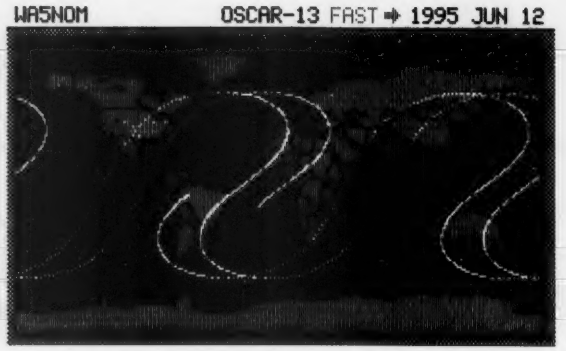

Figure 3. Seven years after launch. Apogee over the equator, drifting southward.

two-meter whip antenna instead of the gain array. When the satellite was in close, less than 13,000 miles, it was possible to copy signals using simple antennas.

Telemetry heard included 400 baud BPSK (bi-phase shift keyed), RTTY at 50 baud (set wpm to 66) and CW at 10 wpm (words per minute). The PSK data is the most common. RTTY can be heard at 15 and 45 minutes after the hour. The CW is activated at 0 and 30 minutes after the hour. The schedule can be changed whenever necessary.

Most amateur stations are not set up for 400 baud PSK reception and decoding. The RTTY downlink provides data on 60 of the 64 available telemetry channels. Amateur Satellite Report number 178 gives updated details on the equation conversion values. This publication is available to members of AMSAT NA. Write: PO Box 27, Washington DC 20044 for details on membership dues.

The general beacon gives information on satellite activities in addition to transmitting telemetry. Possible messages include OSCAR 10 and OSCAR 13 operating schedules and the latest information on satellite control activities and system status.

Like OSCAR 10, the ground track of OSCAR 13 will change during its lifetime. For now, the apogees occur near the equator drifting to the north. In about three and a half years, they will be at their most northerly point. In December 1991, most of the northern hemisphere will have simultaneous satellite access when OSCAR 13 is at an apogee. Since the majority of the amateur population is in the northern hemisphere, activity will be at its peak and DX opportunities will be excellent. Seven years from now, the apogees will be back over the equator and trending southward. By then the satellite will have reached its operational life expectancy. Even though this may seem to be bad news, it is not. By 1995 the amateur space program should be well into developing an upgraded Phase 3 spacecraft or the first Phase 4 geostationary spacecraft.

Get ready for some great times on OSCAR 13. Well over 130 countries were active on OSCAR 10. With more VHF and UHF gear available and a more favorable orbit than on OSCAR 10, overseas activity will increase. Unlike the HF bands, DX contacts via satellite are usually relaxed. There is more conversation, with less hit-and-run activity. Come on up and enjoy the fun via satellite!

Field Day

For satellite chasers or clubs just looking for bonus points, Field Day 1988 on the hamsats was great. Our Field Day group used a KLM 14-element crossed yagi for two meters and a Cushcraft 16 element crossed yagi for 70 cm, and thoroughly enjoyed the OSCAR 10 contacts.

For RS operation via Mode A, we used the two-meter crossed yagi with 20 Watts for the uplink, while a barely functional multiband vertical with the help of a Janeil preamp pulled in the 10-meter downlink.

Although limited to Modes A and B, we logged more contacts than we had on any previous Field Day. With the potential of OSCAR 13's modes, just choosing the gear and antennas will be a chore in 1989. Let's hope so!

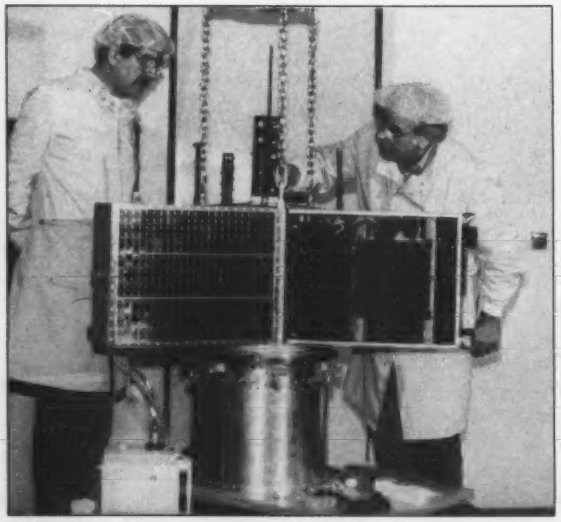

Photo B. Preparing OSCAR 13 for final tests in West Germany.

Photo C. The WA5ZIB satellite station at Field Day 1988.

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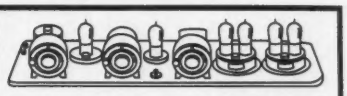

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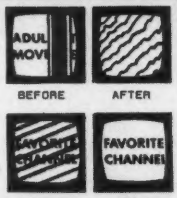

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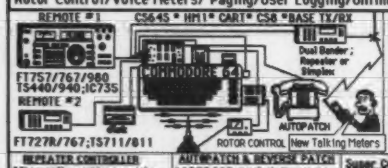

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United Arab Emirates - A61AB

The United Arab Emirates is a loose organization of poorly defined states on the southern end of the war-torn Persian Gulf. The UAE shares a disputed boundary with Oman on the east, and with Saudi Arabia on the south and west. As with most of the countries in the region, the UAE's economy centers around oil, and the UAE has enjoyed the prosperity that oil revenues have brought to the region. However, it remains a conservative Moslem state in many ways, despite its gleaming skyscrapers and wide thoroughfares.

A6 Very Rare On CW

Amateur radio activity from the UAE has been very scarce over the past ten years. Only a handful of operators have made contacts from A6, including A6XB in February, 1979, and A6XJC in 1983. More recently, A61AA and A61AB have been giving out coveted A61 contacts to a few deserving DXers.

In *The DX Bulletin's* 1987 Most Wanted Countries survey, the UAE ranked number 12, with 53% of responding DXers saying they needed A6. UAE steadily climbed the Most Wanted list, from 41st position in 1977, to 30th in 1980.

The UAE are even rarer on CW. Previous A61 hams seldom used CW, and neither current licensee is proficient in the mode. Of all the countries that have been on the air on CW since the start of the CW DXCC on January 1, 1975, the UAE is second only to Vietnam XV on the CW Most Wanted list.

An Opportunity

Early this year, one of the top CW operators in the world had an opportunity to do something about the demand for United Arab Emirates on CW. Jacky Calvo F2CW spent 12 days in Abu Dhabi, the capital city of the state.

In early 1988, Jacky, a veteran of a recent Clipperton DXpedition, was discussing a possible trip to Spratly 1S. When Chinese and Vietnamese ships exchanged gunfire over passage through the Spratlys, Jacky looked elsewhere for a suitable DXpedition location. In discussions with DX Hall of Fame member Kan JA1BK, the call A61AB came up.

Jacky Calvo F2CW dons Arab dress for presentation of his A61AB CW DXpedition slides, at the International DX Convention in Visalia, California.

Kalib A61AB received a donated 205BA 5-element 20-meter beam almost a year ago, and he had yet to put the antenna on his tower. Kan suggested a deal: He would arrange for the donation of a complete kilowatt station to A61AB, consisting of a Kenwood TS-440S transceiver and Kenwood amplifier, if A61AB could arrange official permission for Jacky to go to the UAE, set up the station and the antenna, and operate as long as possible.

The deal was quickly accepted, and Kan assembled, packed, and shipped the gear ahead of time to Abu Dhabi, including Jacky's CW paddle and keyer.

Initial Setbacks

Soon after his arrival in Abu Dhabi on Saturday, Jacky called his host A61AB about going to his house and operating. Jacky was especially anxious to get on the air before the end of the weekend, as more DXers can operate on the weekends than during the week. He immediately received two pieces of bad news. Kalib's schedule precluded Jacky coming over to his house to operate until late Sunday evening. Jacky would have to wait nearly 24 hours after arriving in the UAE before making his first contact.

The second disappointment was more ominous: The radio gear was still in customs. Kalib was confident that the gear could be claimed on Monday, but Jacky had visions of a delay of a few weeks, far past the time for his departure.

On this unsettling note, Jacky attempted to explore the tourist facilities of Abu Dhabi. Not speaking Arabic proved a significant handicap, but Jacky did manage to find the old-time market, now enclosed in the center of a brand-new building.

Thanks to the oil wells peppering the Persian Gulf around the island city of Abu Dhabi, the entire city is brand-new, including dozens of mosques elaborately decorated in gold, gems, and crystal. Jacky's conclusion: "No great tourist paradise."

A61AB At Last!

Finally, Sunday evening rolled around, and Jacky presented himself at the QTH of Kalib A61AB. The two amateurs inspected the 20-meter beam and home-made, self-supporting tower, but it was too late for tower work. Jacky anxiously asked if, since he couldn't work on the tower, could he operate for a while?

Kalib led Jacky to his Yaesu FT-757GX station. Jacky quickly put up a 20-meter antenna, and then looked for a key. There wasn't any! Jacky's CW keyer and paddle were still locked in customs. What to do?

Fortunately an experienced and resourceful DXpeditioner such as Jacky was not at a loss for long. As Bert 5A0A did in a similar situation, Jacky stripped two wires and started tapping them together: CQ CQ CQ DE A61AB. "It reminded me of my first CW QSOs," Jacky said.

His sending was not up to his usual polished fist, but Jacky persevered, and quickly made his first QSO, a prearranged schedule with his sponsor JA1BK. Kan's response to the jury-rigged key: "Is that CW?"

Two hours later, Jacky put down the two pieces of wire, and headed back to his hotel, since he wasn't allowed to stay overnight in the home of his Moslem host. Jacky made 150 contacts in two hours clicking those wires together, a remarkable feat.

The Next Week

The remainder of the week passed very quickly for Jacky. He first attended to the reason for his presence: assembling, tuning, and erecting the 20-meter beam. "I rationed myself to one hour of work on the beam, and one hour of operating," he explained.

Meanwhile another major potential problem disappeared, when Kalib had no trouble getting the gear out of customs, including Jacky's keyer! By Tuesday evening, the beam was up and running. "My contract is finished," Jacky said, and then settled down to some serious operating. He would arrive at A61AB at 9 AM, and, with meal breaks, operate straight through to 10 PM, when he returned to his hotel in town.

"I had no trouble working Europe, but the path to the USA was very difficult, because the European hams would not stand by. Between the QRM, tuner-uppers, and even RTTY interference, stateside contacts were relatively few," Jacky explained at the International DX Convention in Visalia, California, in April.

"Sometimes the same operator would call again with a different call. Perhaps they don't know that I can identify amateurs by their fist. I can certainly recognize the same fist several QSOs in a row. Some of these jokers may find themselves 'not in log,'" he threatened.

The Last Weekend

Jacky received his final disappointment of the trip when he learned that he would not be able to operate during his final days in the UAE, over the weekend of March 5 and 6. His host was returning to his studies at the university 100 miles away, and under the restrictions of his guest operator privileges, Jacky was not permitted to operate A61AB unless Kalib was present.

So Jacky wrapped up his A61AB CW DXpedition on Friday evening, after making 3476 QSOs in 35 hours of actual operating time. He made almost all the QSOs on 20 meters, with a handful on 15 meters.

Upon his return to Japan, Jacky quickly answered all QSL requests. However, as of the end of May, the DXCC desk at ARRL Headquarters had not received required documentation to accept these CW A61AB cards for DXCC credit. At the Visalia convention, Jacky was confident that the appropriate paperwork would be available soon.

At Visalia, Jacky showed obvious frustration over making only 3500 contacts in 12 days in Abu Dhabi, but he did a fine job under the restrictions of his host, and he certainly pleased a lot of CW DXers.

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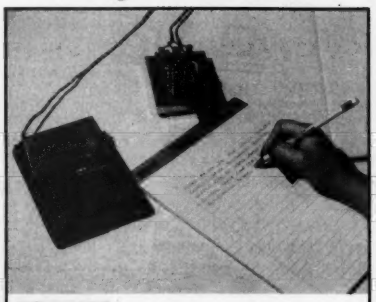

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ELECTRONIC KEYER

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Keyer output	• Transistor switching, Open collector type

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Weight	• 12.5 oz. (358 g)
Controls	• Power On/Off • Random code generator On/Off • Print-out On/Off • Monitor speaker level • Electronic keyer mode select • Speed Up & Down
Display	• LCD 32 characters—16 per line
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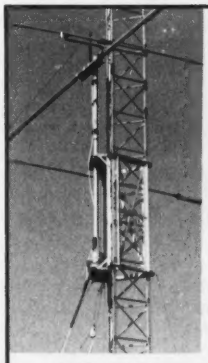

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AERIAL VIEW

Antenna News

Arliss N. Thompson W7XU
Route 3, Box 224
Sioux Falls, SD 57106

Ground Systems for HF Verticals

"The antenna here is a vertical." So goes a commonly heard comment during QSOs on the HF bands. Although hams frequently consider the vertical a second class antenna and malign it as an antenna that "radiates equally poorly in all directions," the vertical is very effective in the proper setting. This month's Aerial View aims to dispel some of the misconceptions surrounding ground system requirements for quarter-wave vertical antennas, and give hints on optimizing vertical performance.

Q & A Time

Q. Why do vertical antennas require ground systems?

A. The ground system of a quarter-wave vertical acts as an electrical mirror image that allows that antenna to be resonant on the same frequency as an ungrounded half-wave antenna. Currents induced in the ground by the vertical radiator are returned to the base of the antenna through the ground. Since current flowing through a lossy conductor means lost power, the best ground system is a low-loss one. Low ground losses mean improved antenna efficiency. For most hams, that means an extensive ground (radial) system around the base of the antenna. A good ground system requires, in most instances, a fair amount space around the base of the antenna—often not available in settings such as city lots.

Hams also often overlook another important aspect of the ground system: its effect on a vertical's low angle of radiation. Good ground conductivity for many (up to 100!) wavelengths around the antenna is necessary to maximize low angle radiation. In most instances, however, it's impractical to extend the radial wires of a ground system to the point where they begin to significantly affect the angle of radiation—and there's also the problem of the often profound effects of the surrounding countryside on a vertical's DX performance. This relationship explains why some hams in regions of poor soil conductivity have poor results with verticals even after they installed an elaborate system of quarter-wavelength radials.

Q. How big does an effective ground plane need to be?

A. At least 120 radials, each ½-wavelength long. Such a system is obviously impossible, however, for all but a fortunate few. Ground conductivity plays an important role here—many more radials are necessary if the ground has poor conductivity (in the desert or in a typical city, for example) than if the conductivity is high (salt water). The rule of thumb is to install as many radials as possible.

Note, however, that for any given number of radials, there is an optimum length for those radials. In other words, four radials each 50 feet long are not equivalent to 20 radials that are each 10 feet long, even though 200 feet of wire is involved in both cases. N2MF (*QST*, June 1985, pp. 28–30) discussed details for optimizing radial systems in this regard. See some of his results in Table One.

Bear also in mind that, when using a vertical shorter than a quarter-wavelength, the importance of a good radial system increases. This is due to the low radiation resistance of electrically short verticals. Since efficiency is related to the ratio of radiation resistance to ground losses, it becomes increasingly important to minimize ground losses as radiation resistance drops. Owners of trap verticals take note.

Q. A good ground system sounds like a lot of work. How much difference will it actually make?

A. Based on Edward's (N2MF) work, a system of four radials, each 0.1-wavelength long, results in a signal approximately 4 dB down from a system of 100 radials that are each 0.4-wavelength long when installed over poor ground. Going to a radial system of 120 radials, each 0.5–0.6-wavelength long, doesn't improve the antenna's efficiency over that of the 0.4-wavelength, 100 radial system, but could lower the wave angle as much as 10 degrees compared to the four radial system (Devoldere, J., *Low-Band DXing*, *ARRL*, 1987, p.2–23). There's somewhat less improvement with good–excellent ground conductivity, but, for maximum performance, a radial system is almost always necessary.

". . . ground rods . . . hardly improve the RF ground at high frequencies."

Some Misconceptions

Q. How about ground rods?

A. Using a ground rod, or even several rods tied together, in place of a radial ground system is a common misconception propagated by some antenna manufacturers. While ground rods are effective DC grounds, they hardly improve the RF ground at high frequencies. They are worth a try if the ground conductivity is particularly high, or if no radial system is possible, but they are not equivalent to even a minimal radial system under most circumstances.

Q. What gauge wire should I use for the radials?

A. Since the current flowing in the ground system is divided among the various radials, wire size is unimportant if there are more than 4–6 radials. The wire may be bare or insulated (the latter will probably last longer when exposed to the elements), and should be copper whenever possible. Steel electric fence wire, although inexpensive, corrodes rapidly, and so loses its effectiveness as a conductor, when in contact with the earth.

Q. How should I install the radials?

A. Place them directly on the surface of the ground (anchored with nails or wire hooks if necessary) or bury them a few inches. They should radiate from the base of the antenna like spokes from a wheel, but, if necessary, bend the wires to conform to the space available.

Q. Isn't it true that a vertical that is ½-wavelength in height doesn't require a ground system?

A. No. A ½-wavelength tall vertical presents a high impedance at its base, so ground losses are less critical for antenna efficiency than with a ¼-wave antenna. As I mentioned above, however, the ground system serves more than one purpose. To get maximum performance from a vertical, install it in a location that exhibits good ground conductivity. If only a rudimentary radial system is possible in an area of poor soil conditions, it's likely a ½-wave vertical will be more efficient than a ¼-wave antenna. Poor conductivity in the far field, however, may prevent either antenna from being a good low angle radiator. In that case, a horizontal antenna mounted at a reasonable height above ground will likely outperform either of the verticals, even in DX applications.

Optimum length versus number of radials.

Number of radials	Optimum length (fraction of wavelength)
4	0.10
12	0.15
24	0.25
48	0.35
96	0.45
120	0.50

Table 1.

Up, Up and Away

Q. What sort of ground system do I need for non-ground-mounted verticals?

A. Verticals mounted above ground are *ground-plane antennas*. If a ham can place the antenna a moderate distance above the earth, it's possible to use a simulated ground that's considerably simpler than the standard radial system used for ground-mounted antennas. A

typical simulated ground (known as a ground plane) is four wires, each ¼-wavelength long, radiating horizontally from the base of the antenna. Together with the ¼-wavelength vertical antenna, they form a resonant -wavelength system.

While just one radial and the vertical alone would form a resonant system, other radials are needed to cancel out the horizontal component of the radiated signal. Even two radials, recommended by the installation instructions that come with some multi-band HF trap verticals, still doesn't give complete cancellation of the signal's horizontal component. Use four wires if possible.

Note also that, unlike the case with the grounded antenna, radial length is critical here. Cut the ground-plane antenna radials a ¼-wavelength.

Q. How high should I mount the ground of a ground-plane antenna?

A. The old adage, "the higher, the better," usually holds true here. If the radials of the ground plane are close to the earth or nearby structures, there may be associated losses due to capacitive coupling to those objects. Also, like horizontal antennas, its height above ground affects a ground plane antenna's angle of radiation. An- tenna when the ground system requirements are considered. The ground plane antenna has reduced needs in that area, but, even so, its radials take up as much room as a dipole. Mounted well above ground, however, a ground-plane antenna can be a good low-angle radiator.

". . . ground conductivity far from the antenna controls how well a vertical functions as a low-angle radiator."

This explanation for this involves the summation and cancellation of the direct and ground-reflected waves at various wave angles. Various editions of the ARRL Antenna Book contain graphs and text that further explain this effect.

Second, ground conductivity far from the antenna controls how well a vertical functions as a low-angle radiator. Long radials can lower the angle of radiation by improving ground conductivity, but short radials have little effect in that regard. In short, a ham living on a small city lot may very well find more DX on his horizontal dipole than on a vertical installed with a marginal radial system, even though the vertical is commonly considered a DX antenna.

Third, ground rods are no substitute for even a few radials, let alone an extensive ground system. Going from no radials to an extensive radial system will give the same effect as more than doubling transmitter output power in areas of poor soil conductivity. If an electrically short vertical is involved, the change in performance will be even more dramatic.

Last but not least, the amateur with only two square feet of backyard and absolutely no room for radial systems or horizontal antennas should go ahead and try a vertical. It will very likely exhibit low efficiency, will not be a particularly effective DX antenna, and quite likely will "radiate equally poorly in all directions," but you *will* make contacts. Just keep its limitations in mind.

Take Home Messages

First, unless the antenna is located in a salt marsh or by the ocean, a properly installed ver- tical is not a limited-space

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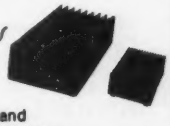
- Made In USA



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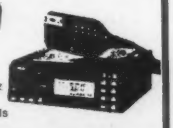

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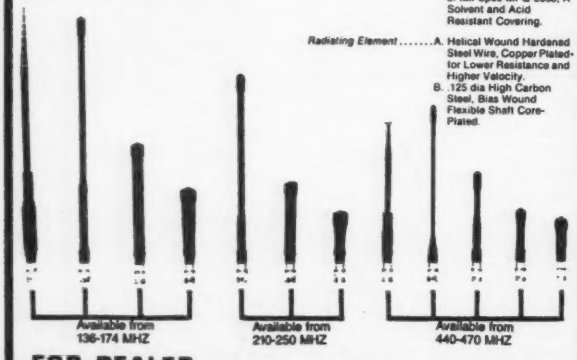

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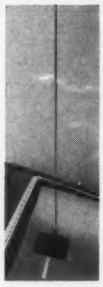

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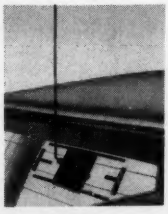

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PROPAGATION

by Jim Gray W1XU

Jim Gray W1XU
P.O. Box 1079
Payson, AZ 85541

A Look at the Recent Past

In late June and early July (as this is being written) the Solar Flux has reached a value of 193 which is the highest since Cycle 21. Normally, you would think that this would bring spectacular DX–but not so! There are some mitigating circumstances: the time of year and the magnetic field of the earth. Unfortunately, these high values of solar flux have been accompanied by high values of the "A" index - the planetary magnetic field index. These have been running anywhere from 10 to 30, which indicates an unsettled to active magnetic field. As you know, when the earth's magnetic field is disturbed like this, HF propagation suffers. Deep fading conditions on a given path, higher than usual QRN, and some paths being closed entirely. Also, when the sun shows great activity (there have been large sun spot groups visible on the disk, frequent solar flares and proton events) the earth's ionosphere can become over-ionized! When over-ionization occurs (and this increases as the sun climbs above the horizon and peaks at local noon sun time—lasting until late afternoon) HF signals are absorbed rather than reflected/refracted. Finally, to add the icing to the cake, the earth is *farther* from the sun at this time of the year than it is in winter, although the northern hemisphere is tilted toward the sun. Longer hours of daylight mean more signal absorption over longer periods, and HF suffers accordingly. The ideal conditions of equal day and night hours (spring and fall equinoxes) are the best for HF.

The other side of the coin, of course, is the absolutely splendid effect on VHF-UHF conditions that the active sun produces. Maximum usable frequencies rise above 50 MHz, meaning that six meters is open on occasion, and indeed we have had some really good openings on six, in June and July. Rarely, but frequently enough to be exciting, auroral conditions exist during times of peak solar activity—especially flare activity—and auroral propagation in the high latitudes takes place on the two-meter band and above. To summarize the condition for the summer, VHF/UHF are above average in activity, while HF suffers badly. The one right spot for HF has been the sporadic E activity when short skip on 10, 12 and 15 meters reigns supreme in the summertime.

Outlook for September

Fortunately, this is all behind us now, and you are looking at a month when DX activity on the HF bands should be superb! The Fall Equinox approaches (September 22nd), solarflux levels and the sun spot count is higher than ever, and the high absortion levels of summer are gone. Now, you'll be having fun on all HF frequencies from 20 through 10 meters. These bands will be open until well after local darkness in the evening hours, and they will open early in the morning.

It looks like the first and last weeks of the month will be very good, while the middle two weeks will be only fair to poor. It is likely that the "A" index will remain high on many days, which is not exactly to our liking, but it's one of those things we have to expect. All evidences point to an early peak of Cycle 22, and perhaps a longer than usual period of peak activity–which may not be quite as high as in the previous cycle, but certainly high enough to provide maximum enjoyment for DXers.

October will be very good, too, from all appearances, and the various contests that month will probably set all-time records for high scores. By now, we hope you have used the summer to good advantage and that your HF antenna arrays are in place and ready for action. . . because you'll be in the middle of it this fall!

I think you'll find the bands somewhat better than this daily chart for September shows, but I'm hedging my bets a little bit in view of the somewhat unusual nature of the solar behavior for the last month or two.

It looks like the period between about the 10th and 24th will not be very good. . . but I could be very wrong. Your best plan will be to check with WWV frequently at 18 minutes past the hour to get the latest reports of A and K index values, and the Solar Flux values.

You will find that when the A index is below 10 and the Solar Flux is above 150, DX conditions should be superb. Try the other chart for a look at maximum usable frequencies to plot the best times from your area to the DX points of interest, and choose the time of day that seems most likely to produce results. You will notice that some paths will be very difficult, while others will be open for most of the day and night.

Make the best of your opportunities, and be prepared to be flexible because the days suggested to be F, P or G may not work out that way at all. I think we'll be lucky to find a correct call about 75–80% of the time.

Let me know how these forecasts are working for you.

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1 G	2 G	3 G
4 G	5 G	6 G	7 G	8 G–F	9 F	10 F–P
11 F–P	12 F–P	13 F–P	14 F	15 F	16 F–P	17 P
18 P	19 P–F	20 F	21 F–G	22 G	23 F	24 F–P
25 F	26 F–G	27 G	28 G	29 G–F	30 F	

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20	–	–	–	–	20	20	–	–	–	15
ARGENTINA	20	20	40	40	–	–	–	–	–	10	10	15
AUSTRALIA	15	–	20	–	–	40	20	20				15
PANAMA	15	20	40*	40*	40	–	20	20	20	10	10	15
WESTERN EUROPE	40	40	40*	40	–	–	20	15	10	10	20	20
HAWAII	15	20	20	40	40	40	20	20	–	–	10	10/15
INDIA	–	–	–	–	–	–	20	20	–	–	–	–
JAPAN	15	20	–	–	–	–	20	20	–	–	–	15
MEXICO	15	20	40*	40*	40	–	20	20	20	10	10	15
PHILIPPINES	–	–	–	–	–	–	20	20	–	–	–	–
PUERTO RICO	15	20	40*	40*	40	–	20	20	20	10	10	15
SOUTH AFRICA	20	–	–	–	–	–	–	–	15	15	10	20
U. S. S. R.	40	40	–	–	–	–	–	15	15	20	–	–
WEST COAST	40	80	–	–	–	–	–	20	20	20	15	40

CENTRAL UNITED STATES TO:

ALASKA	15	–	–	–	–	–	–	–	–	–	–	15
ARGENTINA	15	20	20	40	40	–	–	–	–	–	10	15
AUSTRALIA	15	20	20	20	–	40	80	–	–	–	–	15
PANAMA	15	20	20	40*	40*	–	–	15	15	10	10	15
WESTERN EUROPE	–	40/80	40/80	–	–	15/20	15	15	20	20	20	–
HAWAII	15	20	20	40	40	40*	80	20	–	–	10	15
INDIA	–	–	–	–	–	–	–	20	–	–	–	–
JAPAN	15	–	–	–	–	–	–	–	–	–	–	15
MEXICO	15	20	20	40*	40*	–	–	15	15	10	10	15
PHILIPPINES	15	20	–	–	–	–	–	20	–	–	–	–
PUERTO RICO	15	20	20	40*	40*	–	–	15	15	10	10	15
SOUTH AFRICA	20	–	–	–	–	–	–	–	–	15	15	20
U. S. S. R.	–	–	–	–	–	–	–	20	15	20	–	–

WESTERN UNITED STATES TO:

ALASKA	10/15	15	15	20	20	20	40	40	–	–	–	15
ARGENTINA	10/15	20	20	40–	–	–	–	–	–	–	15	10/15
AUSTRALIA	10	15	15	20	20	40–	40	40–	20	20	15/20	15
PANAMA	20	20	40/20	40/20	40	–	–	20	15	15	10	10
WESTERN EUROPE	–	–	–	–	–	–	–	–	–	15/20	15/20	–
HAWAII	10	15	20/15	40	40*	40*	40	40	–	20	20	20
INDIA	15/20	15/20	–	–	–	–	–	–	20–	–	–	–
JAPAN	10/15	15	15	20	20	20	40–	40–	–	–	–	15
MEXICO	20	20	40/20	40/20	40	–	–	20	15	15	10	10
PHILIPPINES	15/20	15/20	–	20–	–	40–	40–	–	20	20	–	15
PUERTO RICO	20	20	40/20	40/20	40	–	–	20	15	15	10	10
SOUTH AFRICA	20	20	–	–	–	–	–	–	–	15	15	20/15
U. S. S. R.	–	–	–	–	–	–	–	–	20	–	–	–
EAST COAST	40	80	–	–	–	–	–	20	20	20	15	40

* Possible 80 meter opening — Difficult path

HF Equipment	Regular	SALE
IC-781 Xcvr/Rcvr/ps/tuner/scope ...	5995.00	

IC-761 Xcvr/Rcvr/ps/tuner	2699.00	2369
HM-36 Scanning hand microphone	47.00	
SP-20 Ext. speaker w/audio filter ..	149.00	139.95
FL-101 250 Hz 1st IF CW filter	73.50	
FL-53A 250 Hz 2nd IF CW filter	115.00	109.95
FL-102 6 kHz AM filter	59.00	
EX-310 Voice synthesizer.....	59.00	

IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	1449
PS-35 Internal power supply	219.00	199.95
FL-32A 500 Hz CW filter (1st IF)....	69.00	
FL-63A 250 Hz CW filter (1st IF)....	59.00	
FL-52A 500 Hz CW filter (2nd IF)...	115.00	109.95
FL-53A 250 Hz CW filter (2nd IF)...	115.00	109.95
FL-33 AM filter.....	49.00	
FL-70 2.8 kHz wide SSB filter	59.00	
RC-10 External frequency controller	49.00	

IC-735 HF transceiver/SW rcvr/mic	1099.00	959.95
PS-55 External power supply.....	219.00	199.95
AT-150 Automatic antenna tuner ...	445.00	389.95
FL-32A 500 Hz CW filter	69.00	
EX-243 Electronic keyer unit	64.50	
UT-30 Tone encoder	18.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply.....	175.00	159.95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	319.95
MB Mobile mount, 735/751A/761A...	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal for 751A....	79.00	
PP-1 Speaker/patch.....	179.00	164.95
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan.....	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	139.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	589.00	519.95
AH-2 8-band tuner w/mount & whip	659.00	589.95
AH-2A Antenna tuner system, only....	519.00	449.95
GC-5 World clock	91.95	89.95

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IC-275H 100W 2m FM/SSB/CW.....	1399.00	1229
IC-375A 25W 220 FM/SSB/CW.....	1399.00	1099

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IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1099
IC-475H 75W 440 FM/SSB/CW.....	1599.00	1289
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249

IC-471H 75W 430-450 ..... Closeout	1399.00	989.95
PS-35 Internal power supply	219.00	199.95
AG-35 Mast mounted preamp	99.95	
AG-35 (Purchased with IC-471H)	99.95	9.95
SM-6 Desk microphone	47.95	
EX-310 Voice synthesizer	59.00	
TS-32 CommSpec encode/decoder....	59.95	
UT-15 Encoder/decoder interface...	34.00	
UT-15S UT-15S w/TS-32 installed.....	96.00	

VHF/UHF/1.2 GHz Mobiles	Regular	SALE
IC-37A 25w 220 FM/TTP mic Closeout	499.00	349.95
IC-47A 25w 440 FM/TTP mic Closeout	549.00	399.95
PS-45 Compact 8A power supply ...	145.00	134.95
UT-16/EX-388 Voice synthesizer ...	34.99	
SP-10 Slim-line external speaker ...	35.99	
IC-28A 25W 2m FM, TTP mic	469.00	409.95
IC-28H 45W 2m FM, TTP mic	499.00	439.95
IC-38A 25W 220 FM, regular mic	459.00	369.95
IC-38A 25W 220 FM, TTP mic	489.00	389.95
IC-48A 25W 440-450 FM, regular mic	459.00	369.95
IC-48A 25W 440-450 FM, TTP mic....	509.00	449.95
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch.....	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-228A 25W 2m FM/TTP scan mic...	509.00	449.95
IC-228H 45W 2m FM/TTP scan mic...	539.00	479.95
UT-40 Pocket beep function.....	45.00	
IC-900A Transceiver controller.....	639.00	569.95
UX-19A 10m 10W band unit	299.00	269.95
UX-29A 2m 25W band unit.....	299.00	269.95
UX-29H 2m 45W band unit.....	349.00	319.95
UX-39A 220MHz 25W band unit....	349.00	289.95
UX-49A 440MHz 25W band unit....	349.00	319.95
UX-59A 6m 10W unit	349.00	319.95
UX-129A 1.2GHz 10W band unit ...	549.00	499.95
IC-3200A 25W 2m/440 FM w/TTP....	695.00	529.95
UT-23 Voice synthesizer.....	34.99	
AH-32 2m/440 Dual Band antenna ...	39.00	
AHB-32 Trunk-lip mount	35.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	
IC-1200A 10W 1.2GHz FM Mobile.....	699.00	549.95
IC-1271A 10W 1.2GHz SSB/CW base	1269.00	1129
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	125.00	114.95
EX-310 Voice synthesizer.....	59.00	
TV-1200 ATV interface unit.....	139.00	129.95
UT-15S CTCSS encoder/decoder ...	96.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1529.00	1349
RP-2210 220MHz 25W repeater	1749.00	1469
RP-3010 440MHz 10W FM repeater...	1299.00	1149

All Prices in this list are subject to change without notice.

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Hand-helds	Regular	SALE
IC-2A 2-meters.....	289.00	259.95
IC-2AT with TTP.....	319.00	279.95
IC-3AT 220 MHz, TTP	349.00	299.95
IC-4AT 440 MHz, TTP	349.00	299.95
IC-02AT/High Power	409.00	349.95
IC-03AT for 220 MHz	449.00	349.95
IC-04AT for 440 MHz	449.00	389.95
IC-u2AT for 2m w/TTP	329.00	289.95
IC-u4AT 440 MHz, TTP	369.00	299.95
IC-2GAT for 2m, TTP	429.00	379.95
IC-4GAT 440MHz, TTP	449.00	399.95
IC-32AT 2m/440MHz	629.00	559.95

IC-u2A for 2m w/o TTP
Reg. $299 - **Closeout $259.95**

Aircraft band handhelds	Regular	SALE
IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	473.00	369.95
A-2 5W PEP synth. aircraft HT.....	525.00	479.95
A-20 Synth. aircraft HT w/VOR.....	625.00	569.95

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	79.00
BP-8 800mah/8.4V Nicad Pak - use BC-35...	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8.....	21.25
LC-11 Vinyl case for DIx using BP-3	20.50
LC-14 Vinyl case for DIx using BP-7/8	20.50
LC-02AT Leather case for DIx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35....	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case.....	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CA-5 5/8-wave telescoping 2m antenna	19.95
CP-1 Cig. lighter plug/cord for BP3 or DIx	13.65
CP-10 Battery separation cable w/clip.....	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs.....	25.99
LC-2AT Leather case for standard models.....	54.50
RB-1 Vinyl waterproof radio bag.....	35.95
HM-9 Speaker microphone.....	47.00
HS-10 Boom microphone/headset.....	24.50
HS-10SA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10.....	24.50
SS-32SMP Commspec 32-tone encoder	27.95

For other HT Accessories not listed please CALL

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1410G	144-148	10	160	.6	15	13.6	25	UHF
1412G	144-148	30	160	.6	15	13.6	20	UHF
2210G	220-225	10	130	.7	12	13.6	21	UHF
2212G	220-225	30	130	.7	12	13.6	16	UHF
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CIRCLE 157 ON READER SERVICE CARD

73 Advertiser's Product Index

A convenient service for our Readers.

RS#	Company	Page

AMPLIFIERS

314	Ameritron	65
53	Barker and Williamson	21
99	Communications Concepts	69
263	Dentron	79
•	Electronic Equipment Bank	88
327	GTI Electronics	21
•	Heath Co.	53
354	ICOM	Cover 2
•	Kenwood	Cover 4
•	Kenwood	7
•	Kenwood	8
151	Naval Electronics	41
349	Naval Electronics	62
142	RF Enterprises	84
232	TE Systems	79
165	Yaesu	Cover 3

ANTENNAS, TOWERS, CABLE AND ACCESSORIES

65	AEA	92
89	Antennas West	41
90	Antennas West	69
236	Antennas West	79
302	Antennas West	85
303	Antennas West	13
304	Antennas West	21
53	Barker and Williamson	21
42	Bilal	69
•	Butternut Electronics	17
313	Cubex Company	69
•	Delta Loop Antennas	59
263	Dentron	79
360	DMQ	41
•	Electronic Equipment Bank	15
291	Electron Processing	76
•	Garant Enterprises	73
•	Gem Quad Products	93
72	Glen Martin	73
•	Heath Co.	53
270	H.J. Theiler	54
269	Hustler Antennas	21
354	ICOM	Cover 2
•	Jo Gunn Enterprises	66
•	Kenwood	Cover 4
•	Kenwood	7
•	Kenwood	8
•	Lakeview Co.	73
23	Larsen Antennas	13
24	MFJ	3
101	Maxcom	26
163	Mobile Mark	76
167	Orion Hi-Tech	57
29	PX Shack	42
30	QEP	62
150	Radio Works	50
115	RF Connection	73
142	RF Enterprises	84
274	Smiley Antennas	76
183	Spectrum International	54
134	Spiro Manufacturing	53
•	Star Circuits	69
256	Unadilla/Antenna Etc.	42
141	Unadilla/Antenna Etc.	42
38	W9INN Antennas	69
319	Wi-Comm Electronics	50
353	William M. Nye Company	38
165	Yaesu	Cover 3

BOOKS, MAGAZINES, QSL CARDS, TAPES, COURSES

•	ARRL	85
329	AVC Innovations	69
271	Antique Radio Classified	69
157	Cleveland Institute	79
359	Don Johnson W6AAQ	50
128	Electronics Book Club	51
339	GGTE	50
273	Gordon West	31
•	Heath Co.	53
•	N6KW QSL Cards	66
•	W5YI Marketing	88

73 Magazine

•	Code Tapes	59
•	DX Map	61
•	Getting Rich	86
•	Moving	66
•	73 QSL Cards	65
•	73 Subscription	17

REPEATERS, CONTROLLERS, ETC

1	Advanced Computer Controls	93
•	CES/Tri H	26
12	Connect Systems	1
10	Communications Specialists	2
306	Creative Control Products	50
•	Hamtronics	25
354	ICOM	Cover 2
47	Maggiore Electronics	63
348	Micro Computer Concepts/ R&L Electronics	50
295	Micro Control Specialties	70
142	RF Enterprises	84

TRANSCEIVERS, RECEIVERS

355	ACE Communications	66
65	AEA	92
243	AXM Inc	13
•	Heath Co.	53
354	ICOM	Cover 2
•	Kenwood	Cover 4
•	Kenwood	7
•	Kenwood	8
•	PC Electronics	61
142	RF Enterprises	84
165	Yaesu	Cover 3

KITS

194	All Electronics	62
•	CBC International	13
•	Giehl Electronics	50
•	Hamtronics	25
•	Heath Co.	53
34	Ramsey Electronics	43

POWER SUPPLIES, BATTERIES

89	Antennas West	41
90	Antennas West	69
236	Antennas West	79
302	Antennas West	85
303	Antennas West	13
304	Antennas West	21
16	Astron	64
•	Control Products Unlimited	15
•	Heath Co.	53
354	ICOM	Cover 2
•	Kenwood	Cover 4
•	Kenwood	7
•	Kenwood	8
68	Periphex	29
142	RF Enterprises	84
165	Yaesu	Cover 3
112	E.H. Yost	13

COMPONENTS

194	All Electronics	62
4	Amidon Associates	73
53	Barker and Williamson	21
345	Computer Radio	62
•	Electronic Equipment Bank	59
•	Heath Co.	53
22	Jan Crystals	79
320	MAO Electronics	66
252	Midland Technologies	73
68	Periphex	29
•	RF Parts	31

TOOLS, TEST EQUIPMENT

•	Electronic Equipment Bank	95
•	Electronic Equipment Bank	21
75	Fair Radio Sales	85
•	Heath Co.	53
•	Kenwood	7
•	Kenwood	8
•	Kenwood	Cover 4
24	MFJ	3
34	Ramsey	43
79	Vanguard Labs	62
165	Yaesu	Cover 3

KEYS, KEYERS

335	Ace Systems	95
•	Heath Co.	53
24	MFJ	3
142	RF Enterprises	84
361	Vibroplex	41

MISC ACCESSORIES

65	AEA	92
345	Computer Radio	62
•	Electronic Equipment Bank	41
291	Electron Processing	76
327	GTI Electronics	50
346	Great Circle Maps	15
•	Heath Co.	53
354	ICOM	Cover 2
•	Kenwood	Cover 4
•	Kenwood	7
•	Kenwood	8
336	Magnaphase	54
•	Maryland Monogram	62
127	Motron Electronics	73
178	Pacific Cable	66
142	RF Enterprises	84
347	Stone Mountian Engineering	95

RETAILERS

•	Amateur Electronic Supply	78
•	Associated Radio	88
41	Barry Electronics	47
92	Burghardt Amateur Radio	70
350	C & S Sales	93
•	COMB Distributors	59
121	Communications Electronics	35
•	Delaware Amateur Supply	22
133	EGE	96
309	Hamtronics, PA	81
25	Madison Electronics	31
187	Mission Consulting	69
29	PX Shack	42
142	RF Enterprises	84
254	Ross Distributing	79
•	The Ham Station	75
•	Universal Amateur Radio	50
298	VHF Communications	54

COMPUTER HARDWARE AND SOFTWARE

338	Ashton ITC	53
357	AT Fab	66
343	Comm Pute Inc.	13
80	Compumax	54
311	Devcom	73
•	Engineering Consulting	70
339	GGTE	50
175	Hal-Tronix	76
•	Heath Co.	53
358	Intercon Data Systems	66
322	Kasara Microsystems	13
356	Rad-Com	66
351	Zeltwanger Electronics	17

PACKET EQUIPMENT

65	AEA	92
239	DRSI	26
291	Electron Processing	76
17	GLB Electronics	81
•	Heath Co.	53
24	MFJ	3
152	Pac Comm	95
142	RF Enterprises	84
351	Zeltwanger Electronics	17

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11	12	13	14	15	16	17	18	19	20	211	212	213	214	215	216	217	218	219	220
21	22	23	24	25	26	27	28	29	30	221	222	223	224	225	226	227	228	229	230
31	32	33	34	35	36	37	38	39	40	231	232	233	234	235	236	237	238	239	240
41	42	43	44	45	46	47	48	49	50	241	242	243	244	245	246	247	248	249	250
51	52	53	54	55	56	57	58	59	60	251	252	253	254	255	256	257	258	259	260
61	62	63	64	65	66	67	68	69	70	261	262	263	264	265	266	267	268	269	270
71	72	73	74	75	76	77	78	79	80	271	272	273	274	275	276	277	278	279	280
81	82	83	84	85	86	87	88	89	90	281	282	283	284	285	286	287	288	289	290
91	92	93	94	95	96	97	98	99	100	291	292	293	294	295	296	297	298	299	300
101	102	103	104	105	106	107	108	109	110	301	302	303	304	305	306	307	308	309	310
111	112	113	114	115	116	117	118	119	120	311	312	313	314	315	316	317	318	319	320
121	122	123	124	125	126	127	128	129	130	321	322	323	324	325	326	327	328	329	330
131	132	133	134	135	136	137	138	139	140	331	332	333	334	335	336	337	338	339	340
141	142	143	144	145	146	147	148	149	150	341	342	343	344	345	346	347	348	349	350
151	152	153	154	155	156	157	158	159	160	351	352	353	354	355	356	357	358	359	360
161	162	163	164	165	166	167	168	169	170	361	362	363	364	365	366	367	368	369	370
171	172	173	174	175	176	177	178	179	180	371	372	373	374	375	376	377	378	379	380
181	182	183	184	185	186	187	188	189	190	381	382	383	384	385	386	387	388	389	390
191	192	193	194	195	196	197	198	199	200	391	392	393	394	395	396	397	398	399	400

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The Pitch: *73* wants to know what you want to read. Help us by voting on this month's features and columns—you'll find their numbers in the Feedback box on the page preceding this card.

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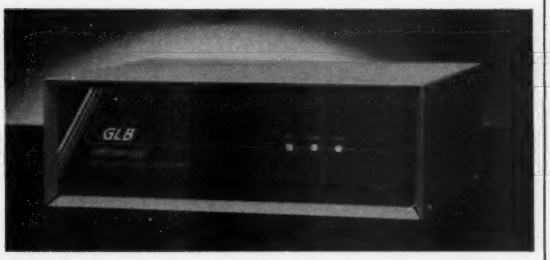

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Data-transparent operation
Digital sampling AFC
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Modulation: FSK
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Power output: 2 W min
Fuse: 3 Amp

Digital sensitivity: .5 uv for 1 error/K
Squelch response time: 1 ms
Spurious output: -60 dbc max
Power: 12 VDC
Operating temperature range: -30 to +60 degrees C
Antenna connector: BNC
RS232 connector: DB25S
Dimensions: 12 × 10 × 4 in.
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CIRCLE 309 ON READER SERVICE CARD

FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we've decided to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed below. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

Do we really read the feedback cards? You bet! The results are tabulated each month, and Larry (our editor in chief) takes a good, hard look at what you do and don't like. To show our appreciation, we'll draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*. To save some money on stamps, why not fill out the Product Report card and the Feedback card and put them in an envelope. Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 25 cents!

Feedback#	Title
1	Welcome, Newcomers
2	Never Say Die
3	QRX
4	Antenna Systems
5	Aluminum Cloud
6	Review: Butternut Butterfly
7	Balloon Supported Antennas
8	Book Review: HF Mobileering
9	Mars & Amateur Radio
10	Auto VIM: Part 2
11	Pee Wee Thirty Transceiver
12	Review: Nye Viking RFM-003 RF Power Monitor
13	Patents are Unique
14	Review: Beauty and the Best by Vibroplex
15	Review: Ramsey CT-90
16	Choosing a QSL Card
17	"The Crew at 22"
18	Review: The MFJ Gray Line DX Advantage
19	New Products
20	Index: 9/88
21	Letters
22	Dealer Directory
23	ATV
24	Hamsats
25	DX
26	Aerial View
27	Propagation
28	Ad Index
29	73 International
30	Ham Help
31	Above and Beyond
32	QTH DX
33	Barter 'N' Buy
34	Special Events

73 INTERNATIONAL

edited by Richard Phenix

The following is from the 3rd Edition (1985) of the *Amateur Radio Operational Manual* of the Radio Society of Great Britain.

Union of Soviet Socialist Republics

ITU allocation: EKA–EKZ, EMA–EOZ, ERA–ESZ, EXA–EZZ. LYA–LYZ, RAA–RZZ, UAA–UQZ, UUA–UZZ, 4JA-4LZ. Byelorussian SSR: EUA–EWZ. Latvian SSR: YLA–YLZ. Ukrainian SSR: URA–UTZ.

Callsign system: Current 1st, 2nd and 3rd class callsigns are made up of a two-letter republic prefix, a number (which is only significant in the case of RSFSR stations, where it denotes the geographical area) a letter corresponding to the administrative region and two serial letters, e.g., UB-5-M-AA. The two serial letters are AA-VZ for individual stations and WA-ZZ for club stations. N.B. Older two-letter calls do not follow these rules.

Each administrative region is also assigned a three-digit number, commonly called the *oblast number*. This is often printed on USSR QSL cards and is significant in some RSF awards.

Prefixes		Union republic
UA	RA	Russian Soviet Federated Socialist Republic (RSFSR)
UB	RB	Ukraine
UC	RC	Byelorussia (White Russia)
UD	RD	Azerbaijan
UF	RF	Georgia
UG	RG	Armenia
UH	RH	Turkmen
UI	RI	Uzbek
UJ	RJ	Tadzhik
UL	RL	Kazakh
UM	RM	Kirghiz
UO	RO	Moldavia
UP	RP	Lithuania
UQ	RQ	Latvia
UR	RR	Estonia
UT	RT	Ukraine
UV	RV	RSFSR
UW	RW	RSFSR
UY	RY	Ukraine
UZ	RZ	RSFSR (club stations)

USSR stations in Antarctica

4K1A	Molodezhnaya
4K1B	Mirny
4K1C	Vostok
4K1D	Novolazarevskaya
4K1E	Komsomolskaya
4K1F	Leningradskaya
4K1G	Bellingshausen
4K1H	Russkaya

Licence notes: Four licence classes. 1st class: all bands, 200W. 2nd class: all bands, 40W. 3rd class: 1.8, 3.5, 5, 7, 14, 28 MHz and VHF, 10W. 4th class: 1.8 MHz, 5W.

Foreign amateur operation: Apply to RSF.

National society: Radio Sport Federation of USSR, Box 88, Moscow D-362.

[Our correspondent, UA9MA, is from the Yaraslov Oblast, number 168–Ed.]

Notes From FN42

The amended, updated, draft Universal Permit Application form promised for September will now appear next month, providing that USSR material (or something else) doesn't come along . . . and slightly delayed thanks to Leonard M. Mendel K5OVC for putting us in touch with our Russian correspondent, Gennady Kolmakov, a few months ago.

The Wiesbaden Amateur Radio Club has sent a crisply efficient set of papers to amateur radio publications, the US State Department, FCC, ARRL, DARC, and others, concerning a letter from the Deutsche Bundespost FTZ office (reference S 21–3 B 3581) to the US Army Amateur Radio License Management Office, HQ, 5th Signal Command. The letter announced that US Novice class license holders will no longer be eligible to receive a reciprocal Class A license in West Germany. The Club says those operators are "the latest target of German Governmental bureaucracy" and is greatly disturbed by the implied criticism, calling it "an unprovoked attack...totally unwarranted" and an adverse decision "made without fully considering the consequences on international levels."

The WeisARC wrote a very temperate letter of protest to the FTZ apparently without effect. This in-

Basic Russian for CW QSOs

Send a true international goodwill gesture

[The following is adapted from a paper by K1KI reprinted from *In The DARC*, printed by the Dallas Amateur Radio Club. Thanks to Editor Cliff White WB5DYA for permission to use the article.]

The intent of the following is to provide a person with no knowledge of the Russian language a series of words, phrases and sentences useful for CW QSOs. Most Russian amateurs know just enough English to carry on basic QSOs (name, QTH, rig, and weather). Conversations tend to be very short, because few people know enough Russian to carry on even a basic QSO. You will find that even a few words in Russian will make QSOs a bit longer and more enjoyable, and that you will begin to get to know a few friends as a result. Even if you find some words sent back to you impossible to understand, your attempt to speak their language will be well received. Although Russian is not the native language of many of the peoples of the Soviet Union, virtually all Soviets understand it.

A Simple QSO:

- *ZDR* (abbreviation for zdrawstwujte).
  Greetings or hello.
- *Wamm signal 599*.
  Your signal is 599.
- *Moe imaa Scott*.
  My name is Scott.
- *Moj QTH Dallas*.
  My QTH is Dallas.
- *Kak slymmite*?
  How copy?
- *Znaim tolxko neskolxko predlovenij po russki*.
  I only know a few sentences in Russian.
- *Moe rig 500w i 4 element lumn*.
  My rig is 500w and a 4 element beam.
- *Povalujsta QSL. Moaa QSL wam budet*.
  Please QSL. My QSL will be coming to you.
- *Spasibo za QSO*.
  Thanks for the QSO.
- *DSW* (abbreviation for do swidaniaa).
  Good-bye.
- *Poka*.
  So long. See you later.

Some weather words:

Weather—*pagoda*	Beautiful—*krasiwo*
Nice/good—*horommo*	Hot—*varko*
Cool—*prohladno*	Cold—*holodno*
Warm—*teplo*	Windy—*wetreno*
Rain—*dovdx*	Snow—*sneg*
5 degrees C—*5 grad*	Cloudy—*oblamnno*
Stormy—*bryno*	Sunny—*solnemnno*
Foggy—*tumanno*	Frost—*moroz*
Lightning—*molniaa*	

A Few More Russian Phrases . . .

- *Vy govorite po anglijyski?*
  Do you speak English?
- *dobryj denx. Dobroe utro.*
  Good day. Good morning.
- *Dobryj wemner. Dobroj nomnx.*
  Good evening. Good night.
- *Mne nuvno wamm QSL.*
  I need your QSL.
- *Aa ne ponimaim.*
  I don't understand.

The underlined letters represent special Russian characters and should be sent as a single character. For instance, "mm" should be sent as "dadadadah," "mn" as "dadadadit.", and "aa" as "didadidah".

One caution: Russian amateurs really are restricted in the topics they are permitted to talk about. Talking politics, religion and other "sensitive" issues is forbidden. Some stations will interpret this much more strictly than others. Remember, too, that mail in the Soviet Union may be read and censored by the authorities. Beware of what items are permitted to be received by mail, and which ones are not (stamps, money, magnetic tapes). Your post office can give you a detailed list.

Despite these caveats, there's still much that you and a Soviet ham can talk about. You will hopefully establish a close relationship with a Soviet amateur, exchange addresses, and begin to learn more about each other.

formation is given here at the request of the WeisARC so that interested readers who become fully informed on this rather complex issue may submit their own protests "to the US State Department, FCC, ARRL, DARC, German Government, FTZ and any others" where appropriate.

Whatever the outcome, it is impressive that the Weisbaden group has taken such a firm and friendly position on our behalf.

QSOing with Japan on September 15th? Be respectful if your opposite number is over 60—it's Respect for the Aged Day over there. If you *are over 60,* demand *respect. You* might *get it. And send Happy (whatevers) as follows: September 1, Army Day, Chile; 3—Independence Day, Qatar (and for Brazil on the 7th; Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua, 15th; Mexico and Papua, New Guinea, 16th; Chile, 18th; Belize, 21st; and Mali, 22nd); 5—Labor (Labour) Day, USA (Canada); 9—National Liberation Day, Bulgaria; 10—National Day, Belize (and Chile, 11th; Lebanon, 22nd; Yemen Democratic Republic, 26th); 12—Revolution Day, Ethiopia; 17—National Heroes Day, Angola; 21—Federal Thanksgiving Day, Switzerland; 23—National Holiday, Saudi Arabia; 24—Anniversary of the Third Republic, Ghana, and Autumnal Equinox Day, Japan; 25—Referendum Day, Rwanda; 28—Confucius Day, Taiwan; and 30—guess who celebrates Botswana Day, today.*

Roundup

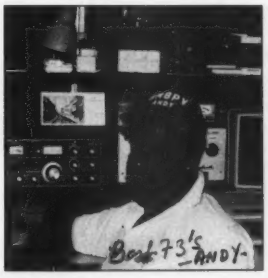
El Salvador. Mario Moran Vega YS1GMV (pictured in the story by W9ELR, "San Salvador Earthquake"—April issue, p. 12) writes of the tremendous gratitude of "the YS Gang...for the massive and fast help" received from "the whole world." He writes of the difficulty of getting *73 Amateur Radio*, but says "It is worth the pain as it always [is] a great magazine." [*So why not become our official El Salvadoran correspondent and get a free year's subscription in return for three reports per year on amateur activities in your country? Will you do this? You could then also help the ham world learn even more about Spanish customs—such as the one about which your letter reminds us.—Ed.*] He notes that the "Mario Tona YS1TG" referred to in the earthquake story is really Mario Giolitti Tona—an all-important difference since that makes him the son of both his mother (last name Giolitti) and his father (last name Tona). In the same way, YS1AZ and YS1FB are not sons of single mothers either, as is indicated by the single last name—their correct names are: Francisco Call Rosales and Francisco Dorja Rodriguez, respectively.

Korea (Republic of). KARL Awards for the Olympic Games, for all hams and SWLs: Class A—Contact with one 6K (special events) station and at least one with each of five HL call areas; Class B—Compose "SEOUL" with last callsign letters of HL stations, including one with 6K or any HL station with call number 88; Class C—Compose "SEOUL OLYMPICS" with last letters from any five DXCC countries, including at least one HL station. From September 1 through October 5, 6K24SO (Olympic Village), 6K88SO (Olympic Park), 6K88BYC (Busan Yacht Center), and HL88_ _ _ stations will be operating. Proofs of contacts/receptions from January through October 5, 1988, will qualify. Apply to KARL, CPO Box 162, Seoul 100, Korea, between October 1, 1988 through October 5, 1989, providing GCR plus 10 IRCs or US$5 and your QSL card. Endorsements may be applied for for specific bands, modes and other pertinent data.

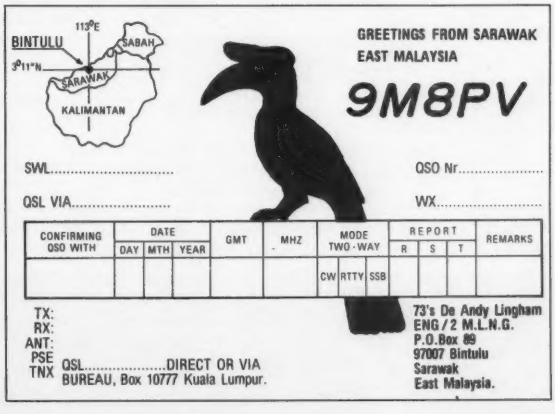
Malaysia. A greeting from Bintulu, Sarawak, from Andy 9M8PV (see photo and QSL card). Andy gets our Most Isolated QTH Award for 1988, and will retain the title thereafter until someone successfully challenges him. Bintulu, population "under 10,000," is at the mouth of the Kemena River, at the end of a secondary road from Miri (population 25–100,000), 200 km away and near the border with Brunei. Nearest town is Pandan, same size, 30 km upriver and apparently not on any road at all. The MIQTHA has been a tradition of this column since September of **this** year, and the Award is a year's subscription to *73 Amateur Radio* plus the privilege of writing two reports for us during the next 12 months, one to two double-spaced pages long, each. (There is no penalty for not writing them!) But do!

HI5@@UD in December 1987. Front to back: HI3LRR, HI3MMT, HI3JMP, HI3LFE with his head turned away.

Vanuatu. The Republic of Vanuatu (an 80-island, 136,000-population archipelago 300 km west of Fiji and 150 km northeast of New Caledonia, has deposited an official instrument of accession with the International Telecommunications Union, bringing ITU membership to 164.



Sarawak's Andy 9M8PV in his QTH.



DOMINICAN REPUBLIC

Lorenzo Fernandez HI3LFE, Secretary
Union Dominicana de Radioaficionados Inc.
Seccional Santiago (HI3UD)
Apartado Postal 449–3
Santiago
Dominican Republic

On the 24th and 25th of September, HI3UD will operate portable HI4 from Tuna Key, a 1-square-km island at 19° 30+' N. Latitude and 71° 30+' W. Longitude. On December 3rd and 4th, HI5@@UD will operate again. At both times the bands and frequencies will be as below. (These also were the same for the HI2UD transmissions June 3–5 during a DXpedition to the island reef of Saona.)

10 meters around 28,450 SSB, 28,050 CW; **15 meters** around 21,250 SSB, 21,050 CW, 21,090 RTTY; **20 meters** around 14,250 SSB, 14,050 CW, 14,090 RTTY; **40 meters** around 7,045 SSB, 7,015 CW; **80 meters** around 3,785 SSB, 3,640 CW.

A special QSL card was sent out in 1987 and different ones will be sent in each year, 1988–1992. Stations which contact HI5@@UD every year will receive a commemorative diploma of the Fifth Centennial of the Discovery of the American Continent in 1492.

QSLs via HI8LC.

rfe

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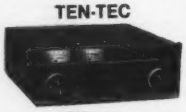

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(Continued from: Pee Wee, page 32.)

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free, on a space available basis. To make our job easier and to ensure your listing is correct, please type or print your request clearly on a full (8½ x 11) sheet of paper. Double space and use upper and lower case letters where appropriate. Also, write numbers carefully—a 1, for example, can be read as an I or an i or a 7. Thanks.

I need a 9.0 MHz USB/LSB crystal filter assembly for a Drake TR-3.

Bob Bartolotta K1YFE
25 Colony Street
Ansonia, CT 06401

Does anyone have ideas for the use of a Probescope Panoramic Indicator or an RTTY test scope? I have the manuals and schematics. Thanks.

Donald R. Lehto WA7WOC
P.O. Box 1411
Carefree, AZ 85377

I am looking for the following manuals/catalogs:
1) *73 Magazine* Feb. 1970. (Electronic Keyer Information)
2) Hewlett Packard Catalogs older than 1980.
3) A manual for a Marconi instrument T72300.
4) Substitution information for the battery used in the 1707B oscilloscope. Battery HP stock #10103B. Does anyone know its voltage or ampere/hour?

Please state manual costs before shipment.

Kevin G. Neal
HCR 62 - 222
Flippin, AR 72634

Is there anyone who has built (or purchased) the K2RIW amplifier (*QST*, Apr., May, 1972) for the 440 MHz band?

Gerald Rose
524 N. Quaker Lane
Alexandria, VA 22304
703-370-1880

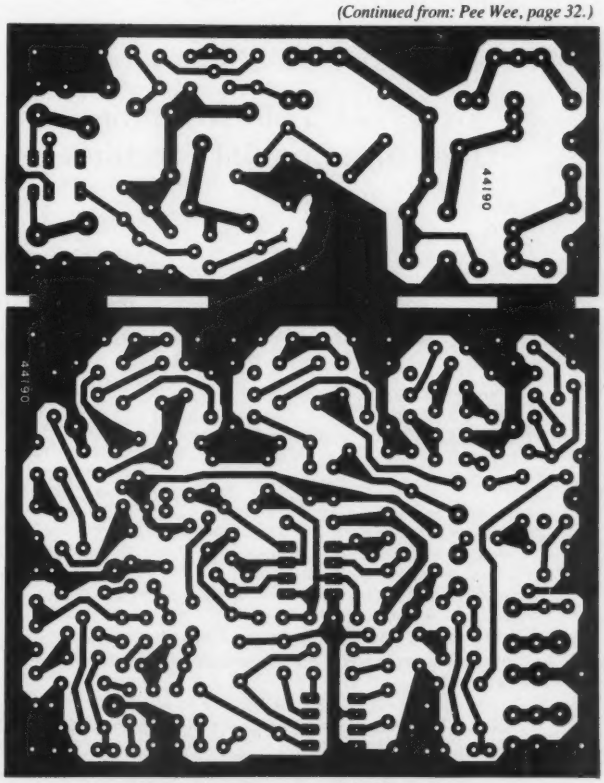

Figure 5 (A). The actual size of the PC board trace.

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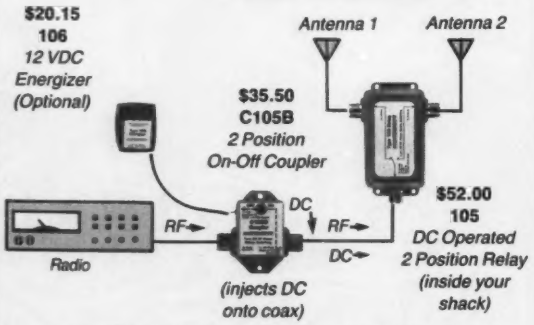

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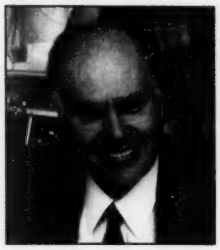

Every time two hams get together at least one says how about if we were to make this great product to sell to hams—not realizing that the ham "industry" is probably one of the best possible ways to guarantee poverty.

No, not all hams are cheap—not all are living on starvation retirement payments—the fact is that some ham firms are doing remarkably well selling to those few hams who are alive and well—and to the handful of newcomers who blunder into our hobby.

The whole trick to survival in the ham market is in getting your sales message to your potential customers—this is called marketing. Marketing includes making sure your literature is as good as (or even better than) your product—and that your sales pitch reaches those few live hams who are your best potential customers.

I'll bet you thought I was never going to mention *73*. Advertising is going to be one of your biggest sales expenses, so give it the serious thought it rates. Advertising is a very well-developed art—billions have been spent on research to find out what works and what doesn't. Indeed I'm working on a video just on how to advertise. In the meantime, if you can take it, I'll mercilessly criticize your literature and your ads—a service no other ham magazine can provide at any price because none of them have anyone with anything even remotely like the 35 years I've had in advertising to hams. Unless you fall into it, it's unlikely you're going to find an ad agency able to help you sell to hams—which is, to be kind, a unique group.

Presuming that sales are of some importance to you, where do you think you'll do best? There are four ham magazines—one for advanced builders—one for contest fanatics—one for ARRL fans—and then there's *73*—which appeals to active hams with small construction projects, with the only world DX column, with columns and news about all of the new ham activities such as packet, RTTY, Oscar and so on. The *73* readers buy circles around other magazine readers because they're active and motivated.

So if you decide to try and fight the odds with a ham product, give it your best shot with *73*—and let me help you win with powerful, sales-oriented literature and ads. A little mail order business at home is a great way to become independent—millions are doing it. Remember, small business is the real strength of America . . . and it's about the only practical way to have a crack at making big money these days.

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FN27...Yet Again!

Well, we did it. After swearing never to attempt a major multi-operator VHF contest again, and vowing not to tear my station apart for the 15th time in eight years...SCORE members made a return pilgrimage to Chincoteague Island for the 1988 June VHF QSO Party.

Perhaps such a return was inevitable. After last year's operation (when the equipment was modest and the band conditions anything but!), the second-guessing commenced in earnest. Could we have broken Top Ten with more power? Higher antennas? More antennas? More operators? More towers? Higher-powered operators using more antennas? The list goes on....

As 1987 turned into 1988, I decided enough was enough. Like General MacArthur, I foolishly stood atop the ruins of my January SS station and cried, "I shall return!"

Early Planning

The plan seemed a cinch. We'd recruit more operators, bring more aluminum, run more power, and separate the six meter station from the rest of the group by at least five miles. Seriously, we planned on bringing two tower trailers and several sections of Rohn 25 to allow more flexibility, especially on the UHF bands, where rotor control was crucial during the active hours.

By March, a more ambitious plan superseded the first. We decided to run stacked antennas on as many bands as possible—including six meters! We put in a great deal of work assembling beams and constructing H-frames in the next few months. Mike Crawford WA2VUN (whose accomplishments as a welder and tower aficionado have been well-chronicled in *73*) came up with a clever design for both the 6 and 2 meter frames, using ⅛" wall 2" diameter aluminum tubing with ⅜" stubs welded on. These stubs then slid inside the cross brace, and the assembly was secured using ⅜" X 2 ½" stainless bolts and wingnuts to prevent pinwheeling.

Antennas

Ivars Lauzums KC2PX provided virtually every antenna used from his stock of F9FT Tonna yagis. The 5-element six meter beam reviewed in the July '87 *73* was the antenna of choice for this trip. Although it's a "short" yagi with a ⅝ wavelength boom, tests showed it played very well when stacked in pairs. We reasoned it might work even better in an "H" configuration. As an added bonus, the dimensions of both the six and two meter H frames were identical...12' by 12'.

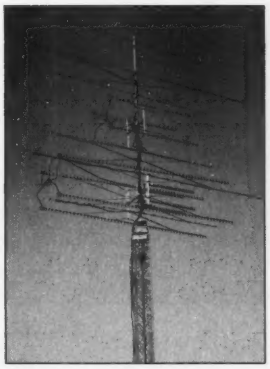

Photo A. A close-up view of the "rat's nest" tower, which contains yagis for 220, 432, 903, 1296, and 2304 MHz!

Rigs

I lined up equipment for each station. On six meters, we ran a Microwave Modules MMT 50-28 driving a 4-1000A through an intermediate amplifier. A Yaesu FT-101 was to be the IF stage. Deb Davis at ICOM made a tremendous effort to secure one of their IC-575H transceivers. It would have been an ideal test of the rig's capabilities, but circumstances and delivery dates didn't work in our favor.

An ICOM IC-275A driving a pair of 3CX800 triodes at over 1 kW output to four 17-element Tonna yagis was the 2 meter rep for the trip. Impressive in any amateur's book! 220 consisted of an IC-375A (reviewed earlier) followed by a rather impressive 8877 amplifier built by Tom Richmond WB2IEY, who agreed to come along for the effort. 220 was the only band that didn't use four yagis, as mast space limited us to a stacked pair of the new Tonna 19-element long booms.

The IC-475A driving a prototype THL-250U amplifier, courtesy of Encomm, Inc, represented 70 cm. Over 250 watts output fed four stacked Tonna 21-element yagis. We also had a Henry 2004, but felt that constant retuning of the plate line during use wouldn't be worth the extra 4 dB or so. Plus, it meant straining the 220 volt supplies to the limit!

903 consisted of an SSB Electronics LT-33S running barefoot to four 23-element Tonnas. Higher power for 33 cm was a priority for this operation, but with all the details, it slipped through the cracks.

1296 was represented by an IC-251 driving an SSB Electronics LT-23S, which in turn fed a single 7289 cavity amplifier at about 45–50 watts output. The antenna system here was by far the most impressive, with four 55-element yagis in an "H" pattern. 220 elements on 23 cm is quite a bit of aluminum!

We also had the LMW-13S transverter on 2304 with a Frontier Microwave 10 watt amplifier feeding four 25-element Tonnas. In addition to all this, Tom Hodge WA2YTM came down from Rochester with some neat gear for 3.5 and 10 GHz, using Dielectric Resonance Oscillators (DROs) for 9 cm and a pair of Gunnplexers on 10 Gigs.

Band conditions had been stellar on six for days preceding the event. A spectacular opening occurred on Monday, June 6, with openings from the east coast of the US and Canada to just about all of Europe. Ken Birmingham WB2IFC worked nearly 200 stations from Chincoteague...using just over 20 watts!

Dame Fortune smiled on us—Ivars located another tower trailer. This particular unit, built years ago by Trevose Electronics in Pennsylvania for emergency service, stood 100 feet tall fully cranked up. Tom Kirk KA2VAD bought it, and we spent the better part of a Saturday restringing the outside lift line to make it work.

The balance of the group was: Bill Radice K2OWR, a long-time veteran of VHF contests, Steve Katz WB2WIK, familiar to readers as the VHF editor of *CQ Magazine*, and Rich Whiten WB2OTK, one of the big guns on six meters from South Carolina. Jim Jarvis N2EA was also to come along, but unfortunately hurt his back and neck the day before.

Bill arrived first at the site on Thursday, 9 June. He set up at the Curtis Merritt Harbor area with his mobile trailer home, expecting to see the rest of the gang before midnight. Was he wrong! Our party didn't get started until nearly 9:30 PM from my house, with a van, pickup truck, station wagon, and rental truck bringing the bulk of the equipment, antennas, and accessories. I drew the unenviable assignment of towing the 100 foot beast, which had a tendency to fishtail above 50 miles/hour, so it was a slow, slow trip...We finally pulled in at 3:30 AM and collapsed in the mobile trailer to rest for a full day of antenna work. 73

(Continued next month.)

Photo B. Pete KT2B logging QSOs and updating dupe sheets on a AMQ portable PC. Using the computer allowed the contesters to produce clean logs ½ hour after the contest was over.

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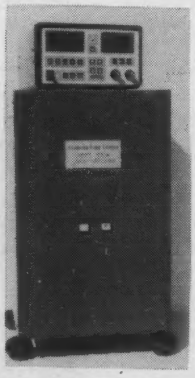

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Land of the Rising Sun

Many American hams know a fair amount about Japan (JA-JS), yet there are many surprising details about that fascinating country not widely known.

For example, while Japan's great economic growth is common knowledge, many people are not aware of the extent of that achievement. Japan leads the world in building ships, passenger cars, television sets, and radio receivers. Its rate of growth in manufacturing exceeds that of all other non-Communist countries. It is first place in daily newspaper circulation and number of television transmitters. More people use motorcycles for transportation than anywhere else. Its fishing industry is more productive than that of any other country.

Today Japan is the third richest country in the world. Some economists predict that by the year 2000, just 12 years from now, Japan will be the foremost economic power in the world.

It is also widely know that Japan is a very crowded country. It is slightly smaller than California, but has nearly five times the population. In Tokyo, the typical couple lives in a two-room apartment of only 400 square feet. In suburbia, the average family lives in a house about the size of one of our two-car garages. But Japan also leads the world in the rate of housing construction.

Despite such cramped living quarters, Japan ranks first among larger countries on the "Physical Quality of Life Index." Even so, it also leads the world in the consumption of alcoholic beverages.

Behind those rankings, which were reported in George Kurian's *New Book of World Rankings*, are Japan's well-known, but unusual, management techniques. In many firms employees start every workday by enthusiastically participating in what Americans call "pep rallies." Workers motivate themselves to greater output by chanting slogans, poems, and songs. Typical is the company hymn, "Grow, Matsushita, Grow, Grow, Grow."

In addition, in many Japanese companies, all employees at all levels, from the newest laborers to veteran executives, participate in decision making. In their view, the decision itself is not as important as insuring that everyone is informed and committed.

While many Americans have heard about these curious processes, fewer know that the techniques have been unified in a system of management called "Theory Z." Theory Z was named by an American management consultant, William Ouchi. He says the theory is based on the concept "that involved workers are the key to increased productivity."

Many Americans know that this theory is now being used in various forms and degrees by some of our own companies. The diversity of those firms is surprising: They include Hewlett-Packard, Intel, Rockwell International, United Motors, and others.

The Japanese have also incorporated innovations into their agriculture. The typical Japanese farm covers only 2.5 acres. At the start of this century, the country produced only 80 percent of the food needed by its residents. Today, Japanese farmers use scientific methods and chemical fertilizers, making the country self-sufficient in rice, and nearly so in fruits and vegetables.

It is also well known that education is afforded major emphasis in Japan. According to the editors of the Time-Life book, *Japan*, the Japanese are "the world's most educated people." Although attendance is not required, more than 90 percent of Japanese youth graduate from high school. (In the United States, only 44.7 percent of our youth complete four years of high school.) On tests taken by students in 19 industrialized countries, the Japanese scored highest on most subjects.

To help insure academic achievement, Japan has more than 20,000 private schools specializing in preparing youngsters for the tough high school entrance exams. They attend these private schools every morning before going to their regular schools, or late in the afternoon and early evening, and many return for still more concentrated study. Some of these schools even have dormitories for students who study too late at night to return home.

It is generally known that the Japanese are big on proverbs, but it is less well known that many of their wordings, which seem so quaint to Americans, are in essence quite common proverbs in our country. For example: The Japanese say, "Ichi ni yojo, ni ni kusri," which translates as "Sanitation first, medicine next." We say, "An ounce of prevention is worth a pound of cure." They say, "Hotoke-no-kao mo sando," meaning "Even Buddha is provoked upon being importuned three times." We say, "Even a worm will turn."

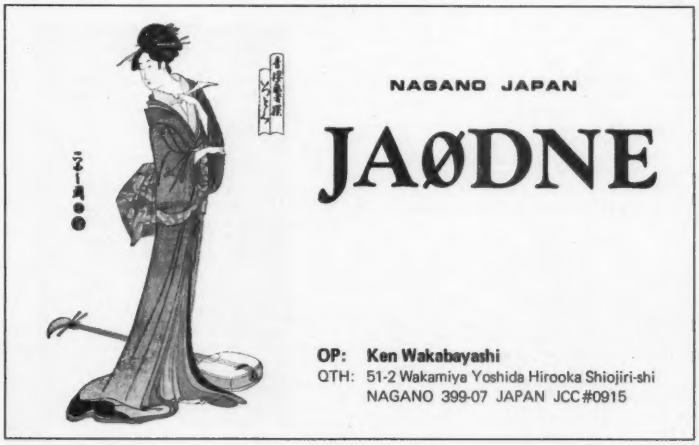
Hamming in Japan also provides some surprises. For example, when 20 meters is open to the Orient, there are so many Japanese on the air that many American operators get the impression that almost everyone in Japan must be a ham. Actually, there are only 33,043 Japanese hams, or one out of every 3,674 residents, which is about one-seventh of the United States' ratio of one ham for every 544 residents. But as the typical US DXer knows, Japanese hams are persistent, diligent, and committed. They love to contest. They compete with a vengeance. They chase QSL cards like gold.

Yet apparently few American hams realize that the skills in speaking English so many Japanese hams demonstrate often come not from real knowledge of our language, but from weekend cram courses which specialize in teaching just enough English to handle bare-boned QSOs.

As previously noted, some economists predict that by the year 2000, Japan will be the foremost economic power in the world. In preparation for that era, Japan is planning several "mega-projects." On a 1,100 acre landfill in Tokyo Bay, a "subcity" of 24 highrise buildings, condos, and shopping centers will be built for 44,000 residents and 115,000 workers. Nearby, a 245-acre man-made island will provide the headquarters for international satellite communications. A $6.4 billion roadway crossing the bay will include the world's longest bridge and the world's longest underwater tunnel. Ashore, Japan intends to build some 3,700 miles of new roads, more than 50 commuter airports, and 15 international airports.

All that does not include the tunnel and bridge completed this year which, for the first time, have tied together Japan's four major islands.

But DXers should really cheer for Japan's most spectacular proposal ever: the construction of an island 270 miles square, larger than Singapore and Hong Kong combined. The island would provide homes for about a million people, and would be an independent new country! 73



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Continued from page 12

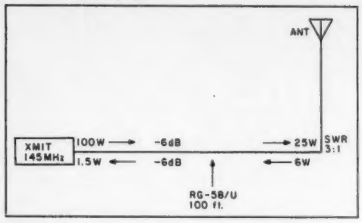

Figure 9. This is the loss analysis for the arrangement in Figure 8.

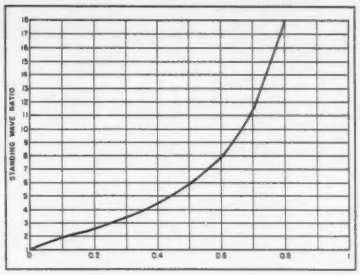

Figure 10. Ratio of reflected power based on SWR.

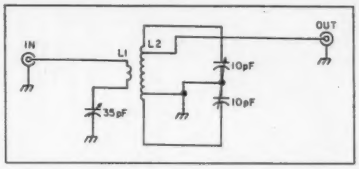

Figure 11. VHF transmatch.

Why are reports from the fringes improved with the higher SWR antenna with the radials?

A knowledgeable member of the committee examined the data that was gathered and reasoned that without the radials the total impedance that the whole antenna system saw was a simple impedance divider consisting of the antenna impedance of 25Ω and the ground resistance of 25Ω. This situation is the same situation that exists with *any* divider. Therefore, 50 percent of Joe's radiating power was being radiated by the antenna into the ether and 50 percent was going into heating up the ground. When the radials were installed the ground resistance went to zero, essentially and the load that the antenna system saw consisted only of the antenna impedance. Since the antenna impedance was 25Ω, working in a 50Ω system the SWR had to come out to be 50:25 or 2:1. The major difference being that all of the transmitter power output was going into antenna radiation *except* for losses in the transmission line.

The Bottom Line

What were the actual powers radiated in each of these instances?

The power output of Joe's rig was 100 watts as measured into a dummy load. In order to get to the antenna, Joe had to run 100 feet of RG 8/U.

From the chart,the loss per 100 feet of RG 8/U at 7.0 MHz is 0.42 dB. This means that when Joe's transmitter output of 100 watts gets to the antenna, there is only 90.9 watts left. The rest is lost in the coax. In the first instance when Joe was operating without radials with an SWR of 1:1, a 25Ω RF ground return, 50% of his usable power went into the ground, or a loss of an additional 3.0 dB for a total loss of 3.42 dB.

When Joe was operating without radials and a good SWR his total radiated power was down to 45.5 watts from his original 100 watts.

When ground radials were installed the forward line loss of 0.42 dB still existed. The only other loss experienced was an additional loss due to the 2:1 SWR. What does this mean?

The incident power wave suffers a loss due to transmission line attenuation. In an unmatched antenna system there is an additional loss that the *reflected* power wave suffers in its travel from the antenna back to the transmitter end of the transmission line. The additional loss amounts to about 0.11 dB (from the graph for a total loss of 0.53 dB. When Joe was operating with radials and experiencing the higher SWR his radiated power was 88.5 watts. Compare this with the 45.5 watts from an antenna system with an SWR of 1:1. How can this be? Isn't reflected power lost and dissipated in the finals of the transmitter?

The answer to both of these questions is "No." As stated earlier, as long as you can provide a conjugate match with the transmitter output tuning or other matching circuit (Transmatch), the impedance that the reflected wave sees at the transmitter end of the transmission line is $0 \pm jX$. No power is absorbed. It looks like a short circuit where the electric field collapses and the magnetic field increases. This causes total re reflection of the reflected wave back towards the antenna and is additive to the transmitter supplied power. The reflected power wave never reaches the finals. The reflected wave *does* cause a change in the input impedance of the antenna system that must be tuned out. If this is not done, the finals will dissipate power that it cannot deliver to the antenna system due to a mismatch between the transmitter and the antenna system.

Feedline Radiation

What about feed line radiation with the higher SWR?

Hogwash! The feed line is completely enclosed in the outer shield of the coax. One way a feed line can radiate, and not to any significant amount, is for the transmission line to be asymmetrically placed with relation to the antenna. If Joe had wrapped his coax around the radiating element, a current would have been induced in the outer skin of the shield.

Another way a feed line can radiate is when the currents in the two conductors are unequal. This happens when you feed a balanced antenna with unbalanced transmission line. Feeding an inverted V directly with coax is the most common situation of this type of condition. The cures are either to use a balun (explained later), or to detune the transmission line by selecting line lengths from the *ARRL Antenna Book*, Chapter 3, Fig. 3-49. But this has no relationship to the SWR. The only time feed lines radiate is when something else is wrong.

A True Story

Another scenario follows. This is a true story and it concerns an antenna situation at the QTH of a fellow amateur. It shows the relative unimportance of SWR as a standalone entity.

This fellow is interested in packet. And since packet is usually operated simplex on VHF, he decided to run a lot of power: 100 watts. An 8–9 year old Ringo Ranger was on his roof and was fed with 100 feet of RG 58/U. After some power supply agonies, we got the rig on the air and measured an SWR of 1.2:1 at the input to the transmission line. We were encouraged, just like Joe Ham. Since the antenna and connectors had been exposed for a long time, I suggested an up close inspection. We took the SWR meter with us and hooked it up right at the base of the antenna. The transmitter was turned on and the SWR measured 3:1 between the antenna and the feed line. How can this be? The SWR was so good at the input end and so bad at the antenna transmission line junction. I got out the ARRL Antenna Book and on page 76, lo and behold, there appeared almost the exact situation that we had. It was surprising to me that the loss in 100 feet of RG 58/U at 150 MHz is 6dB. Refer to Figure 6 to see that RG 58/U is not very good at these frequencies.

Of the original 100 watts in, only 25 watts reached the antenna. The rest was dissipated in the coax.

From Figure 10 it can be seen that a mismatch of 3:1 means that 24% of the power will be reflected, or 0.24 X 25 watts = 6 watts. Of the 25 watts reaching the antenna, 6 watts would be reflected. In its travel from the antenna back to the input, this 6 watts will see the same 6dB attenuation as the incident wave. So 6 watts attenuated by 6dB means that 1.5 watts arrives back at the input as the measured reflected power wave. 100 watts measured going in and 1.5 watts measured coming back yield an SWR of 1.2:1.

The cure? Replace the RG 58/U with lower loss cable, such as RG 8/U, to reduce the line losses and use a VHF Transmatch to accommodate the mismatch at the antenna.

By itself the SWR looked excellent. But by itself the SWR is by *no* means a measure of antenna system efficiency.

Insertion Loss

You don't get something for nothing. Adding a Transmatch, or any kind of matching device will cost you. The cost is called "insertion loss" and it means exactly what it says. If you insert something in the antenna system, there is a price to pay.

The widely used Transmatch insertion loss has been pegged at 3% by Lew McCoy, the inventor. Other types of antenna tuners will probably be about the same. [Part two in next month's issue of *73*]

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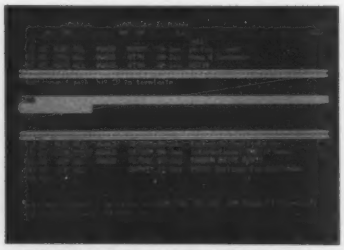
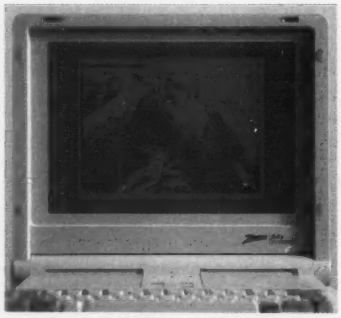
1 Versatility

The PK-232 should be listed in the amateur radio dictionary under the word Versatile. One data controller that can transmit and receive in six digital modes, and can be used with almost every computer or data terminal. You can even monitor Navtex, the new marine weather and navigational system. Don't forget two radio ports for both VHF and HF, and a no compromise VHF/HF/CW internal modem with an eight pole bandpass filter followed by a limiter discriminator with automatic threshold control.

The internal decoding program (SIAM[tm]) feature can even identify different types of signals for you, including some simple types of RTTY encryption. The only software your computer needs is a terminal program.



PC Pakratt Packet TX/RX Display



Facsimile Screen Display

2 Software Support

While you can use most modem or communications programs with the PK-232, AEA has two very special packages available exclusively for the PK-232....PC Pakratt with Fax for IBM PC and compatible computers, and Com Pakratt with Fax for the Commodore 64 and 128.

Each package includes a terminal program with split screen display, QSO buffer, disk storage of received data, and printer operation, and a second program for transmission/reception and screen display of facsimile signals. The IBM programs are on 5-1/4" disk and the Commodore programs are plug-in ROM cartridges.

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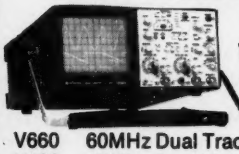

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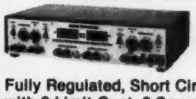

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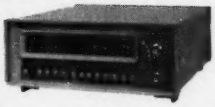

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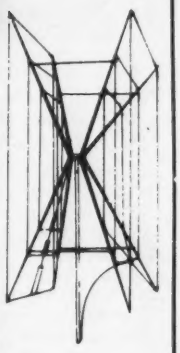

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SPECIAL EVENTS

Ham Doings Across the Country

PUSAN KOREA
SEP 1–OCT 5

During the Seoul Olympic Games, the Pusan Kyong Nam Branch of KARL will be operating 6K88BYC for members of KARL, Olympic participants, and visiting hams. There are special awards for the three classes: A = HL5AP, B = HL88AP, C = HL5AP and HL88AP. Contact *Byong-joo Cho HL5AP, P.O. Box 4, Haeundae, Postal No. 612-600, Pusan, Korea. C.C.*

ANAHEIM CA
SEP 2–4

Hamcon 88, sponsored by the Orange County Council of Amateur Radio Organizations, will be held at the Disneyland Hotel. The convention includes technical sessions and forums, VEC exams, Woulf Hong, banquet, Sunday T-hunt, and the latest equipment. Contact *Hamcon Inc., PO Box 3695, Huntington Beach CA 92605.*

TITUSVILLE PA
SEP 3–4

N3GCN will operate from Titusville, Pennsylvania, from 1400Z to 2230Z daily to commemorate the 3rd year of the Oil Creek and Titusville Railroad. Suggested frequencies are CW: lower 25 kHz of Novice subbands; SSB: lower 25 kHz of General bands 80 to 15; also Novice SSB 28.350. For special QSL send SASE or IRCs to *N3GCN/OL2T, RFD 1, Box 143-G, Titusville PA 16354. DX: QSL to K3HWL, c/o 3rd District QSL Bureau.*

WATERFORD CT
SEP 3–5

The Tri-City ARC will operate KA1BB from the Waterford, Connecticut I-95 weigh station to promote safe Labor Day driving. This is in conjunction with the 6th annual Stay-Awake Coffee Stop offered by BSA Troop 24, Niantic, CT. Operation will be from 1700Z to 2300Z in the middle of the 80, 40, 20, and 15 meter general class phone and CW bands. Talk-in to Coffee Stop on FM 146.52 direct and CB Channel 19. QSL with SASE via *Tri-City ARC, PO Box 686, Groton CT 06340.* For information, contact *Bob Dargel KA1BB, 8 Willow Lane, East Lyme CT 06333; 203-739-8016/1300.*

SAN MATEO CA
SEP 3–9

The San Mateo RC, station W6LMN operating as W2**0**0LMN, will celebrate the 200th anniversary of the US Constitution. It will operate all modes and bands from 1500Z to 0500Z daily on the beginning date until 2359Z on September 9. For a QSL, send your QSL and a large SASE to *W6LMN Trustee, PO Box 751, San Mateo CA 94401.*

ORANGE CA
SEP 3–9

The Rockwell (Autonetics Electronics Systems) RC will operate WB2**0**0YPX to celebrate the anniversary of the Constitution. Suggested frequencies: 25 kHz from low end of general phone bands; 50 kHz from low end of CW bands; Novice CW—7.115, 21.115, 28.115. Special QSL card for SASE to *Dan Violette KI6X, 1122 E. Sail Ave., Orange CA 92665.*

ATLANTIC CITY NJ
SEP 7–10

Southern Counties ARA will operate K2BR from the Miss America Pageant on the suggested frequencies: Phone, 25 kHz inside lower general class band; CW, 65 kHz lower band; and Novice, 28.100–28.500 MHz. For QSL, send an SASE #10 via *SCARA, PO Box 121, Linwood NJ 08221.*

PUT-IN-BAY OH
SEP 9–11

The Oliver Hazard Perry Expeditionary Force will occupy Perry's Victory and International Peace Memorial to commemorate the 175th anniversary of The Battle of Lake Erie and Canadian-American peace and friendship. WD8LKI will operate on suggested frequencies 28.365, 21.365, 14.265, 7.265, and 3.965 MHz. For certificate, send QSL and large SASE to *Como. Wills, 30372 Bates Road, Perrysburg OH 43551-3828.*

UNIONTOWN PA
SEP 10

Uniontown ARC W3PIE, celebrating its 50th year, will hold its 39th Annual Gabfest on the Club grounds. Registration, $3 each or two for $5. Talk-in on 147.045/.645 and 145.17/144.57. *U.A.R.C. Gabfest, %John T. Cermak WB3DOD, PO Box 433, Republic PA 15475. 412-246-2870.*

BOONE IA
SEP 10

The Boone A.R.E.S. will operate K**0**CY from 1400Z to 2300Z in conjunction with the 12th annual "Pufferbilly Days" commemorating the railroad. Frequencies: 7.260, 14.300, 28.385, 145.01 packet, and 146.25/.85 RPT. For QSL, send SASE and QSL to *Pufferbilly QSL, PO Box 127, Boone IA 50036.*

TUSCALOOSA AL
SEP 10

Using callsign KC4GS, the West Alabama ARS will operate a special event station honoring college football and coach Paul "Bear" Bryant. The club will operate in the bottom 25 kHz of the general 80–40–20–15 meter bands and monitor the club repeater on 147.90/.30 MHz. QSL and SASE for 8½ x 11 certificate to *WAARS (Bear Station), PO Box 1741, Tuscaloosa AL 35403 or callbook address of WD4DAT.*

MILFORD CT
SEP 10

The Greater Bridgeport ARC will operate WA1RJI at the 17th annual Engine 260 Antique Fire Apparatus Show and Muster at Eisenhower Park. Phone frequency, 14.300 from 1400Z to 2200Z. For special certificate, send 9 x 12 SASE to *GBARC, %Sterling House Community Center, 2283 Main St., Stratford CT 06497.*

STIRLING NJ
SEP 11

The Tri-County Radio Association is sponsoring their annual indoor Hamfest/Flea Market from 8 AM to 3 PM in the Passaic Township Community Center. Cost $3, tables $8 ($10 with power), reserved tailgating. Talk-in on 147.855/.255, 146.52, and 444.975/.449/.975. Call *Dick Franklin W2EUF, 201-232-5955* or write *POB 182, Westfield NJ 07090.*

MILTON WI
SEP 11

The Tri-County ARC W9MQB will hold its 2nd annual Fall-Fest from 7 AM to 2 PM outdoors by the Black Hawk Technical College between Janesville and Beloit. Admission, $2. Bring your own tables. Talk-in on 144.85/145.45. *Tri-County ARC, PO Box 321, Milton WI 53563.*

JOLIET IL
SEP 11

The Bolingbrook ARC will hold its 4th annual Ham/Computerfest at the Inwood Recreation Center in Joliet. Indoor and outdoor displays, with VEC testing, seminars, dealers, guest speakers. Talk-in on 147.33 and 224.54. Contact *Ed Weinstein WD9AYR, 7511 Walnut, Woodridge IL 60517; 312-985-0527.*

BUTLER PA
SEP 11

The Butler Hamfest will be at the Butler Farm Show Grounds from 9 AM to 4 PM. Huge outdoor flea market with free set-up. Tables and space indoors for vendors. Food, prizes, parking. Contact *John Varljen K3HJH, 174 Oak Hills Hts., Butler PA 16001; 412-283-9403.*

LAPORTE IN
SEP 11

The LaPorte and Michigan City ARCs will hold their Summer Hamfest at the Fairgrounds. Inside tables, tailgating. Talk-in on 146.52. For information and registration, contact *LaPorte ARC, PO Box 30, LaPorte IN 46350.* For table reservations, contact *Tom KA9ZUM, same address.*

LOS ANGELES CA
SEP 15–OCT 2

Special event station W6LAF, sponsored by the L.A. Area Council of ARCs, will be on the air 1700–0500 UTC from the L.A. County Fair. Suggested frequencies: 3900, 7250, 14250, 21350, 28450 plus two meter packet and phone, 220 phone and 440 ATV and phone. Announcements will be via the W6FXN repeater 145.460 and the LAACARC. For embossed certificate with the fair logo and theme "Making Tracks," send QSL and 45 cents in stamps to *W6LAF, PO Box 1770, Covina CA 91722.*

SANTA ROSA CA
SEP 17

The 6th annual SCRA Ham Radio flea market, formerly held in Sebastopol, is in Santa Rosa this year. Free admission. Tables, $7 at door, $5 in advance. VEC exams, exhibits, radio clinic, door prizes, auction. *Sonoma County Radio Amateurs, Inc., Box II6, Santa Rosa CA 95402.*

WICHITA FALLS TX
SEP 17

The Wichita ARS will have a "Swap 'Til You Drop" Hamfest from 7 AM to 6 PM. Flea market, exhibitors, VEC exams. Tickets $7 at door, $6 in advance. *WARS Hamfest, PO Box 4363, Wichita Falls TX 76308.*

BARRIE ONTARIO
SEP 17

The theme of the Packet Radio Symposium, sponsored by Hex-9 Barrie ARC, is "Educate for 88." Basic packet operation. Talk-in on 146.25/146.85 VE3LSR. Inquire *Hex-9 Group, Box 254, Barrie, Ontario CANADA L4M 4T2.* $5 pre-register via packet *VE3FJB-1.*

NEW KENSINGTON PA
SEP 18

The Skyview ARS K3MJW Hamfest will feature prizes and flea market. Talk-in on 146.04/.64. Admission $2. For more information, contact *John Thompson WB3FYP, 1014 Cable Ave., Pittsburgh PA 15238; 412-828-5966.*

HADDONFIELD NJ
SEP 18

The South Jersey Radio Association is holding their 40th SJRA Hamfest from 8 AM to 2 PM. Admission, $3; tailgating or table, $5. VEC testing, door prizes. Talk-in on 144.69/145.29. Contact *Alan Sherman WB2OEZ, Hamfest Chairman, 609-768-8380 or SJRA, PO Box 1026, Haddonfield NJ 08033.*

OLD WESTBURY NY
SEP 18

The LIMARC ARRL Long Island Hamfair will be at the NY Institute of Technology. Tailgating $5, admission $3. Non-hams and children free. Talk-in on 146.25/.85. Call *Mark Nadel NK2T, 516-796-2366.*

GOSHEN NY
SEP 24

The Orange County ARC is sponsoring its 3rd Hamfest. $2 at door, indoor tables $5 in advance or $6 at door; outdoor space $3 in advance or $4 at door. VEC testing. Talk-in on 146.760. Call *914-564-0688* or write *Barbara N2AWI, RD 2 Box 447, Wallkill NY 12589.*

SANTA FE NM
SEP 24

The Northern New Mexico ARC Hamfest will feature vendors, tailgate flea market, and programs for hams. Admission, $5. Children under 12, $3. Talk-in on 146.22/.82. Contact *Clem Burke W5IXR, Box 73, Ojo Sarco NM 87550.*

LAKE ISABELLA CA
SEP 24–25

The Bonnet Brigade, ladies' auxillary of Simi Settlers ARC, will operate WA6OHX 24/1500 UTC to 25/1900 UTC as part of their 1st annual Reunion Raid. HF freq. are: 14288, 7233, and 3886 kHz. The YL-only station will QSL contacts with specially designed cards. QSLs via *WA6OHX.*

ANTIOCH CA
SEP 24–25

The Delta ARC will operate KA6SIP to celebrate the Antioch Rivertown Jamboree. Frequencies: SSB, 7.260, 14.260, 21.360; 10 meter Novice 28.360; FM, 146.540/S; and packet 145.01. For commemorative QSL, send QSL and #10 env. to *Tom Deeble KA6SIP, 2224 Carmel Ct., Pittsburg CA 94565.*

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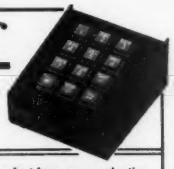

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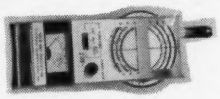

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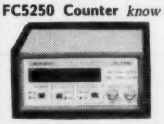

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